

# SUPPLEMENT.

## The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

[The MINING JOURNAL is Registered at the General Post Office as a Newspaper, and for Transmission Abroad.]

2562.—Vol. LIV.

LONDON, SATURDAY, SEPTEMBER 27, 1884.

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SILVER MEDAL, ROYAL CORNWALL POLYTECHNIC  
Highest Award for Effectiveness in Boring, and Economy in  
the Consumption of Air.

JUBILEE EXHIBITION, 1882.

THE PATENT

"CORNISH" ROCK DRILL.

FIRST  
SILVER  
MEDAL,  
MINING  
INSTITUTE  
OF  
CORNWALL.

FIRST  
AWARD  
BORING  
CONTEST  
DOLCOATH  
MINE,  
DECEMBER,  
1881.



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THE PATENT  
"CLIPSE" ROCK-DRILL  
AND  
"RELIANCE AIR-COMPRESSOR."

Silver Medal awarded at Boring Competition, East Pool Mine, Sept. 1883.



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ENGLISH, FOREIGN, and  
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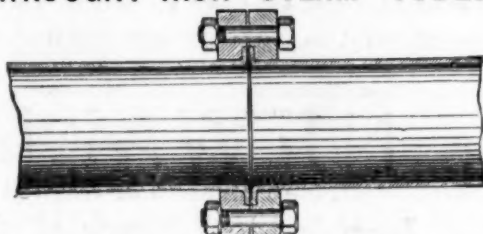
**J. S. MERRY,**  
ASSAYER AND ANALYTICAL CHEMIST,  
SWANSEA.

FULFILLS ASSAY OFFICE REQUIREMENTS AND RE-AGENTS.

IMPROVED PATENT  
**INGERSOLL  
ROCK DRILL**  
MEDALS AND HIGHEST AWARDS.

American Institute, 1872.  
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London International Exhibition, 1874.  
Manchester Scientific Society, 1875.  
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Rio de Janeiro Exhibition, 1875.  
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WROUGHT-IRON STEAM TUBES.



TUBES FOR BOILERS, PERKINS'S, and other HOT-WATER SYSTEMS.

For Catalogues of Rock Drills, Air Compressors, Steel or Iron Steam Tubes,  
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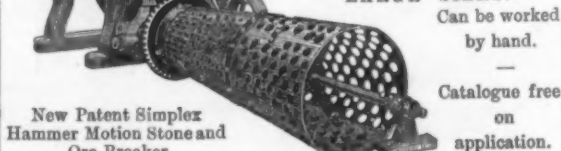
**ROCK DRILLS**  
FOR  
**HAND AND POWER.**



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**S. MASON and Co.,**  
STONE MACHINE WORKS,  
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It only has five wearing parts;  
others have 26.  
LARGE SIZES.



New Patent Simplex  
Hammer Motion Stone and  
Ore Breaker.  
N.B.—A Machine can be seen working at the Metropolitan Board  
of Works.

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With R. SCHRAM'S  
Patent

Inlet and Outlet Valves.  
**BOILERS, TURBINES.**

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**ROCK DRILL.**

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**All Kinds of Mining Machinery.**

ESTIMATES AND FULL PARTICULARS ON APPLICATION.

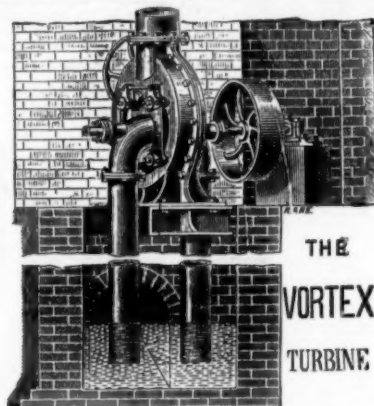
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All Orders executed promptly, and Tenders from Plans  
and Specifications.



# BELL'S ASBESTOS.

**BELL'S PATENT ASBESTOS BLOCK PACKING for High-Pressure Engines**  
The following testimonials refer to this Packing:—

Mona Lodge, Amlwich, Anglesey,  
2nd August, 1884.

DEAR SIR,—I have much pleasure in answering your note. Bad times in mining have compelled me to try all kinds of expedients in order to effect saving; some have succeeded and some have failed, but my underground manager, Capt. Hughes, has just said to me by the telephone—“The Asbestos Packing is the best thing ever brought here.” It saves money and trouble, but like my gas purifying oxide it lasts so long that you must not expect another order from me for twelve months at least.

Yours truly,  
T. F. EVANS,  
Late H.M. Inspector of Metalliferous Mines.  
Manchester, Sheffield, and Lincolnshire Railway—Steamship Department,  
Grimsby, April 10th, 1884.

DEAR SIR,—I have much pleasure in stating that after a trial of over nine months, and comparing it with other packings, I can confidently recommend your Asbestos Packing. It is especially valuable when high-pressures are employed, as in cases where other packings have perished, owing to high temperatures, your packing has invariably stood well. I have also used it with complete success when a gland has been heated with other packings, and also in cases of badly scored piston rods. I consider the results I have obtained by its use for our marine engines to have been in every way highly satisfactory.

Yours truly,  
G. H. CLARKE, Sup. Engineer.  
Department of the Director of Navy Contracts,  
Admiralty, Whitehall, 20th June, 1884.

SIR,—I have to inform you that your tender has been accepted for Bell's Rolled Cloth Asbestos Packing to sample submitted:—Elastic core ... Round.

To Mr. John Bell.  
The Patent Block Packing is square, as Fig. 1 and Figs. 2 and 3 represent the Round Block Packing with solid and hollow rubber core, and Fig. 4 without core, but with rubber inlaid. As these packings are extensively imitated, and as it is a common practice among dealers and agents to supply the cheaper manufactures at my list prices, users are requested to see that the packing supplied to them bears the trade mark.

**BELL'S ASBESTOS BOILER PRESERVATIVE.**—This useful mixture by absorbing the free oxygen that is in the water entirely checks pitting and corrosion. It also disintegrates incrustation so immediately as to prevent its adhering to the plates. Not only is a great economy of fuel effected by keeping boilers clean, but the risk of having the plates burned is thereby obviated. It has been computed that  $\frac{1}{4}$  in. thick of incrustation causes a waste of 15 per cent. of coal;  $\frac{1}{2}$  in., 50 per cent.;  $\frac{3}{4}$  in., 150 per cent. Thus the Preservative avoids the great risks which are inseparable from scaled plates, lengthens the life of a boiler, and covers its own cost a hundred-fold by economy of fuel. It is entirely harmless, and has no injurious action on metals. It can be put into the feed tank or boiler, as may be most convenient. Sold in drums and casks bearing the Trade Mark, without which none is genuine.

**BELL'S ASBESTOS YARN and SOAPSTONE PACKING**  
for Locomotives and all Stationary Engines running at very high speed with intense friction.  
Sandwell Park Colliery, Smethwick, 1st February, 1884.

To Bell's Asbestos Works.  
DEAR SIR,—I have much pleasure in stating that I have used your Asbestos Packing for the last 13 months for our large winding engines which are running night and day, and also for the fan, pumping, and hauling engines at the above Colliery, and during that period we have not used more than one-third the Packing we had formerly; and this I attribute to your Packing on account of its great durability and general excellence of quality.—I am, dear Sirs, yours faithfully,  
THOMAS WINTER, Colliery Engineer.



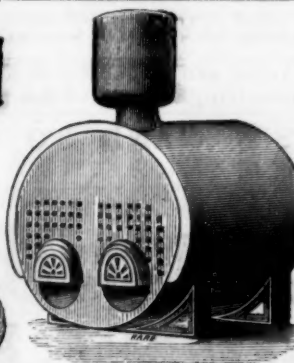
**BELL'S ASBESTOS.**  
The goods of this house are of the highest quality only, and no attempt is made to compete with other manufacturers by the supply of inferior materials at low prices. All “home” orders should be sent direct to the undermentioned depôts and not through Agents or Factors.



FIG. 1.



FIG. 4.



**BELL'S ASBESTOS BOILER AND PIPE COVERING COMPOSITION.**—This coating every class of steam pipes and boilers, non-combustible and easily applied, when once it is up; adheres to metals and preserves them from rust; prevents the unequal expansion and contraction of boilers exposed to weather; covers 50 per cent. more surface than any other coating, and is absolutely indestructible. It can be stripped off after many years' use, mixed up with 20 per cent. of fresh, and applied again. The composition is supplied dry, and is only to be mixed with water to the consistency required for use.

A Horizontal Boiler, 17 ft. 8 in. long, 15-H.P., gave the following results:—  
Temperature on Plates - - - 186 deg.  
Covering - - - 94 deg.  
One ton of coal was saved per week, and although the fire was raked out every evening, 20 lbs. of steam were found in the boiler next morning.

The following Testimonials refer to this Covering:—  
DEAR SIR,—It may interest you to know that we have exactly 48 per cent. in fuel through using your covering.

Yours truly,  
W. SANTO CRIMP, C.E., F.G.S.  
The Tamar and Kit Hill Granite Company (Limited),  
Gunnislake, Tavistock, 8th April, 1884.  
SIR,—I have much pleasure in stating that the Asbestos covering applied by you to the boiler of our travelling crane at Kit Hill has yielded most remarkable results. Since it has been in use we have saved fully half our coal, and have effected a great saving in the time it takes to get up steam, which is often a matter of great importance to us. I should add that the crane runs on high girders, and is fully exposed to all weather. I have formed the highest opinion of your Asbestos as used for this purpose, and as you are aware, have had another boiler similarly covered, though it has not since been used. I can most strongly recommend the material.

I am, Sir, yours faithfully,  
W. J. CHALK, Assoc. M.Inst.C.E., Engineer and Manager.  
**BELL'S ASBESTOS and INDIA-RUBBER WOVEN TAPE** and SHEETING, for making every class of Steam and Water Joints. It can be bent, by hand to the form required without puckering, and is especially useful in making joints of manhole and mudhole doors. It is kept in stock in rolls of 100 ft., from  $\frac{1}{4}$  in. to 3 in. wide, and any thickness from  $\frac{1}{16}$  in. upwards. Manhole covers can be lifted many times before the renewal of the jointing material is necessary. The same material is made up into sheets about 40 in. square, and each sheet bears the Trade Mark, without which none is genuine. It is very necessary to guard against imitations of this useful material, and to secure themselves against being supplied with cheap inferior articles at my price, users are recommended to see that every 10 ft. length of the Asbestos Tape purchased by them bears the Trade Mark.

**BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD** for Dry Steam Joints, made of the best Asbestos fibre, is well-known for its toughness and purity, and is absolutely free from the injurious ingredients frequently used to attain an appearance of finish, regardless of the real utility of the material. Made in sheets measuring about 40 in. square, from 1-64th in. to 1 in., and  $\frac{1}{2}$  millimetres to 25 millimetres thick. Each sheet bears the Trade Mark.

The following copy of acceptance of tender refers to above:—  
Department of the Director of Navy Contracts.

SIR,—I have to inform you that your tender for Asbestos Millboard has been accepted.—Mr. John Bell.  
JOHN COLLETT, Director of Navy Contracts.

**BELL'S ASBESTOS EXPANSION SHEETING (PATENT).** This Sheeting is another combination of Asbestos with India-rubber, giving to the steam user the special advantages of both materials. The India-rubber Washer is protected from the action of heat and grease by an outer coating of vulcanised Asbestos cloth, thus producing an excellent joint where expansion and contraction render other materials unserviceable. This material is admirably suited to steam pipe joints and every class of valve. Valves made of this material are very durable, as they are not subject to injury by oil.

## BELL'S "ASBESTOS LUBRICANT."

ILLUSTRATED PRICED CATALOGUE FREE ON APPLICATION TO

**BELL'S ASBESTOS WORKS, SOUTHWARK, LONDON, S. E.**

OR THE DEPOTS—118a, SOUTHWARK STREET, S.E.,

Victoria Buildings, Deansgate, MANCHESTER.

11 and 13, St. Vincent Place, GLASGOW.

39, Mount Stuart Square, CARDIFF.

21, Ritter Strasse, BERLIN.

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**Iron & Steel Ropes of the highest quality for Collieries, Railways, Suspension Bridges, &c.**

PATENT STEEL FLEXIBLE ROPES AND HAWSERS.

IRON STEEL, AND COPPER CORDS.

LIGHTNING CONDUCTORS.

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Liverpool: 7, NEW QUAY.

Glasgow: 68, ANDERSTON QUAY.

MANUFACTORY: GATESHEAD-ON-TYNE.

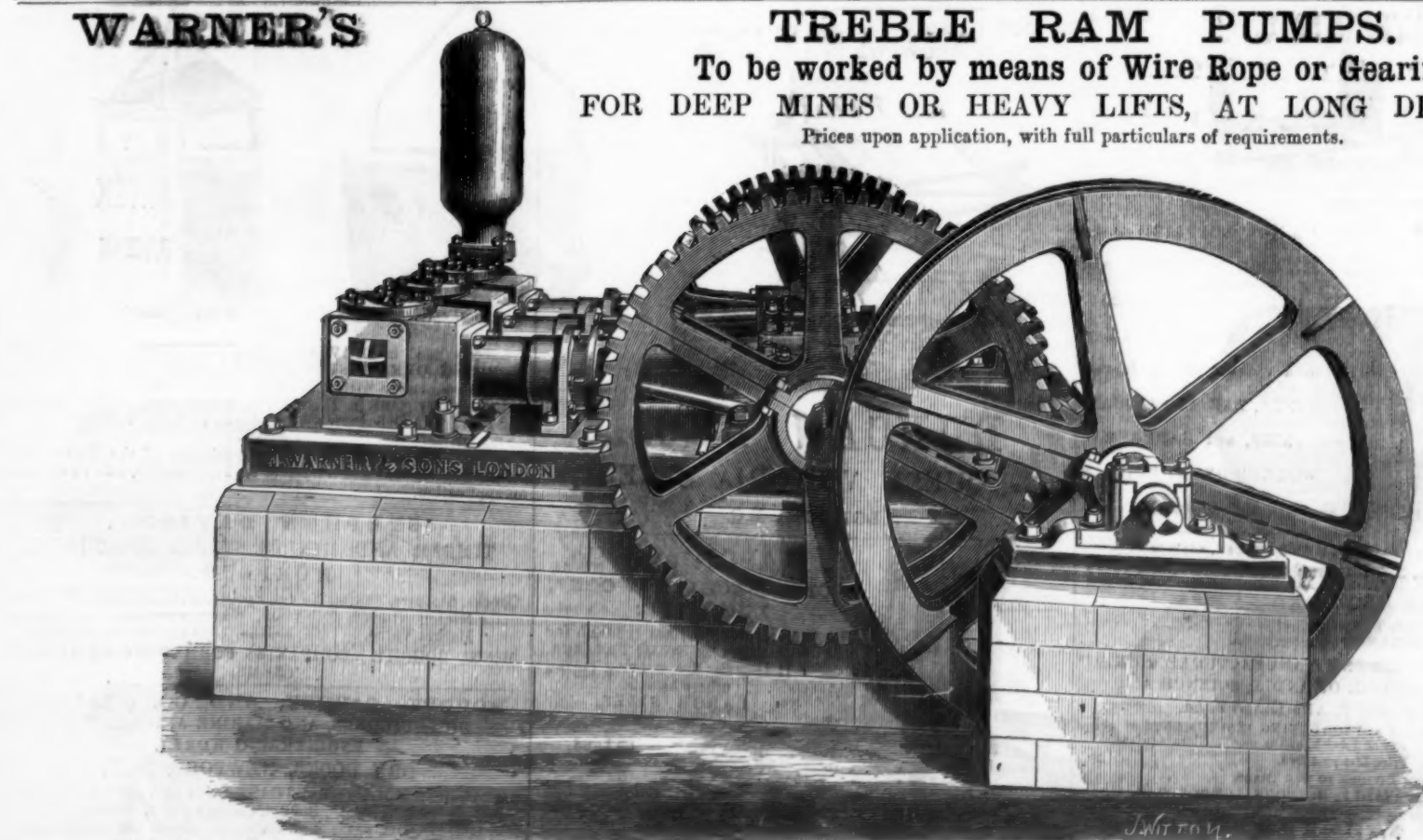
## WARNER'S

## TREBLE RAM PUMPS.

To be worked by means of Wire Rope or Gearing.

FOR DEEP MINES OR HEAVY LIFTS, AT LONG DISTANCES.

Prices upon application, with full particulars of requirements.



As supplied to Messrs. DOWES, of Springwell Colliery, Gateshead, for a Lift of (600) Six hundred feet vertical through two miles of pipes.

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## Patent Steel Trucks, Points and Crossings,

## PORTABLE RAILWAY, STEEL BUCKETS, &c., &c.

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In connection with the  
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town.

### GILDERSOME FOUNDRY, NEAR LEEDS.

(Near Gildersome Station, G.N.R. Main Line, Bradford to Wakefield and London,  
via Laisterdyke and Ardsley Junctions.)

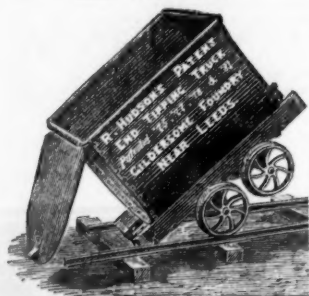
Registered  
Telegraphic Address:—  
"GILDERSOME,  
LEEDS."  
A. B. C. Code used.

UPWARDS of 25,000 of these Trucks and Wagons have been supplied to the South African Diamond Mines; American, Spanish, Indian, and Welsh Gold, Silver, Copper, and Lead Mines; Indian and Brazilian Railways, and to Railway Contractors, Chemical Works, Brick Works, and Coal and Mineral Shippers, &c., &c., and can be made to lift off the underwork, to let down into the hold of a vessel, and easily replaced. They are also largely used in the Coal and other Mines in this country, and are the **LIGHTEST, STRONGEST,** and most **CAPACIOUS** made, infinitely stronger and lighter than wooden ones, and are all fitted with R. H.'s Patent "Rim" round top of wagons, requiring no rivets, and giving immense strength and rigidity. End and body plates are also joined on R. H.'s patent method, dispensing with angle-irons or corner plates.

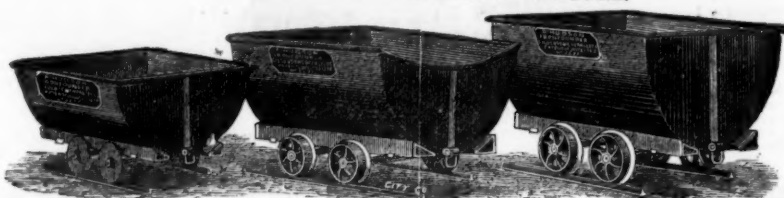
Patented in Europe, America, Australia, India, and British South Africa, 1875, 1877, 1878, 1881, and 1883.  
N.B.—The American, Australian, Indian, and Spanish Patents on Sale.

### CAN BE MADE TO ANY SIZE, AND TO ANY GAUGE OF RAILS.

1.—PATENT STEEL END  
TIP WAGONS.

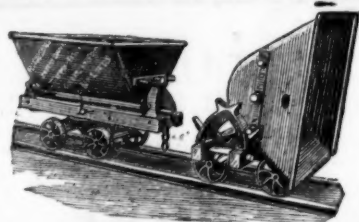


7.—PATENT STEEL MINING WAGONS.

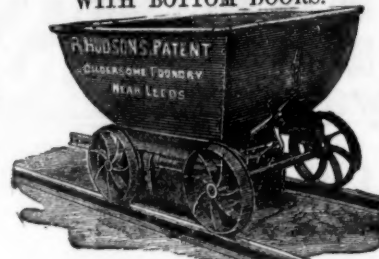


12.—PATENT STEEL HOPPER WAGON,  
WITH BOTTOM DOORS.

2.—PATENT UNIVERSAL TRIPLE-CENTRE  
STEEL TIPPING TRUCK,  
Will tip either SIDE or either END of rails.

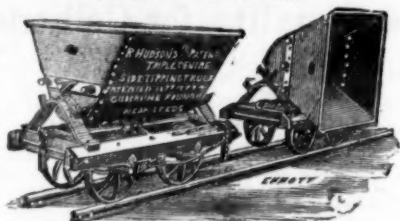


8.—PATENT DOUBLE-CENTRE STEEL  
SIDE TIP WAGONS,  
Will tip either side of Wagons.

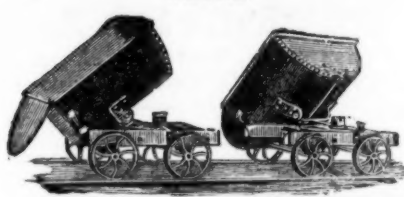


13.—PATENT STEEL HOPPER WAGON.

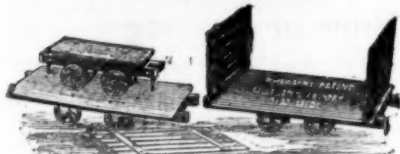
3.—PATENT TRIPLE-CENTRE STEEL  
SIDE TIP WAGONS.



9.—PATENT STEEL ALL-ROUND TIP  
WAGON.



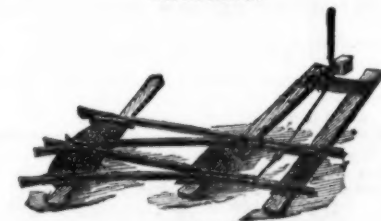
4.—PATENT STEEL PLATFORM OR  
SUGAR CANE WAGON.



5.—PATENT STEEL CASK.  
As supplied to H.M. War Office for the late war in Egypt).  
DOUBLE the STRENGTH of ordinary Casks without any  
INCREASE in weight.  
(Made from 10 gals. capacity upwards to any desired size.)



10.—LEFT-HAND STEEL POINT AND  
CROSSING.



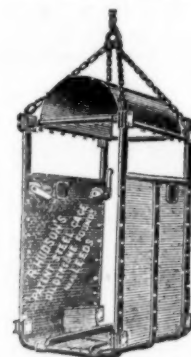
11.—RIGHT AND LEFT-HAND STEEL  
POINT AND CROSSING.



14.—SELF-RIGHTING STEEL  
TIP BUCKET.  
(The "CATCH" can also be made SELF  
ACTING if desired.)

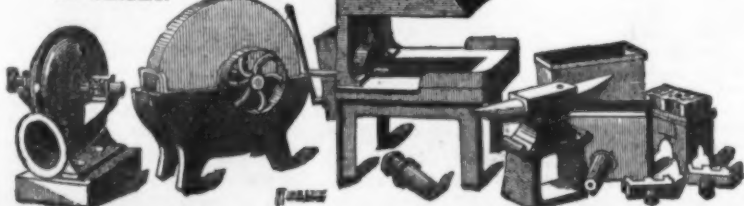


15.—STEEL CAGE.



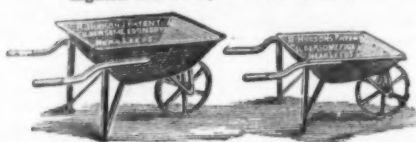
6.—ROBERT HUDSON'S  
PATENT IMPROVED IRON SMITH'S HEARTH,  
NO BRICKWORK REQUIRED.

A Special quality made almost entirely  
in STEEL, effecting a GREAT SAVING  
IN WEIGHT.



Large numbers in use by all the principal Engineers in this  
country and abroad.

16.—PATENT STEEL WHEELBARROWS.  
Made to any Size.  
Lightest and Strongest in the Market.



A great success.

18.—"AERIAL" STEEL  
WINDING TUB.



Largely employed in the South African  
Diamond Fields.

17.—STEEL SELF-CONTAINED  
TURNTABLE.



(Also made in CAST IRON for use where  
weight is not a consideration.)

No. 19.—PATENT STEEL CHARGING BARROW,  
DOUBLE the STRENGTH & much LIGHTER than ordinary Barrow



ALL KINDS OF BOLTS NUTS, AND RIVETS MADE TO ORDER ON THE PREMISES



Pumping Engines  
for  
Mines, Water Works,  
Sewage Works,  
and  
General Purposes.  
CATALOGUES ON

# PUMPING & MINING MACHINERY. HATHORN, DAVEY, & CO., LEEDS.

Hydraulic Pumps,  
Winding Engines,  
Air Compressors,  
Man Engines,  
Capstans,  
&c., &c.  
APPLICATION.

## THE "ADELAIDE" ROCK DRILL.

THE BEST IN THE MARKET.

### ADVANTAGES.

Great Simplicity and Durability. Great Strength and Portability.  
Great Economy in Consumption of Air. High Rate of Drilling.

### REASONS.

It has no Valves or Tappets. ONLY ONE MOVING PART.  
It works expansively, & is almost entirely constructed of Steel.

### PROOFS.

TESTIMONIALS. See Circular, sent free on application.  
A FREE TRIAL at any Mine or Quarry in Great Britain.

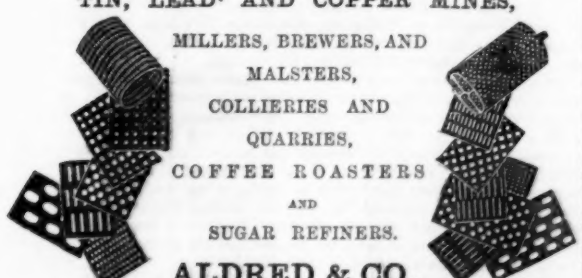
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WORKS: PARKER STREET, ASHLEY LANE,  
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**TABLES FOR ASCERTAINING THE PRICE OF TIN ORE**  
AT A GIVEN STANDARD AND PRODUCE:  
To which is added Tables for Ascertaining the Value of any Quantity of  
Black Tin, from 1 lb. to 10 tons, at any price from £20 to £100 per ton.  
Originally compiled and calculated by the late Mr. R. WELLINGTON; and now  
extended, reprinted by Mr. W. BAILLET, of Cambrone, and carefully verified  
throughout.

London: MINING JOURNAL Office, 28, Fleet-street, E.C.; and may be had  
by order of all Booksellers.  
Australia: GEORGE ROBERTSON, Melbourne, Sydney, Adelaide, and Brisbane.

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**COMPOUND DIVISION COST SHEET READY RECKONER.**  
Designed for effecting in minutes what has hitherto taken hours  
to accomplish.  
For use in making out Cost Sheets of Collieries, Ironstone and other Mines,  
Iron, Gas, and Water Works, Quarries, and Manufactories generally.  
For Accountants, Merchants, Public, and Private Offices.

By WILLIAM WETHERED.  
This work is applicable to calculations where any number of articles cost is  
given sum, and the price of one of such number is required.  
The circulation of such a book as this must necessarily be limited. It is  
doubtful whether it will pay more than the bare cost of publishing, allowing  
nothing for the enormous amount of labour such a mass of figures has occasioned.  
The price cannot be named at less than 25s., and it is not too much to say that  
where it can be applied its cost will be saved in a few weeks. It will be found  
invaluable to accountants generally.

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NEW OR SECONDHAND MACHINERY.

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### THE BATTLE OF THE SHAKERS.

Some twenty or more years ago a description was published in the  
*Mining Journal* of an improved elastic shaking table or vanner, in-  
vented by Mr. HOFMANN, and slightly modified machines on the  
same principle have since been patented by several manufacturers.  
At present an amusing piece of warfare is going on in America  
between the owners of two rival Hofmann's, and taking the claims  
of the respective makers together, a nice little mathematical question  
arises, and will probably require some one more expert in figures than  
a senior wrangler at a worn-out University like Cambridge to answer.  
The Frue Concentrator saves from 40 to 100 per cent.—take the ave-  
rage, and call it 70 per cent.—more than any other concentrator; and  
the Triumph Concentrator has proved by actual trial that it can save  
13.15 per cent. (the decimals must not be forgotten) than the Frue.  
Now, if a machine not named saves 80 per cent. of the precious metal  
proved by assay to be present in the ore, what percentage will be  
saved by the Frue and the Triumph respectively? The Frue saves  
70 per cent. more than any other concentrator, and consequently  
saves 80 per cent. plus (80 x 70 ÷ 100) 56 per cent., making 136 per  
cent., which, put into plainer language, means that more than 41  
worth of gold can be extracted out of ore containing but 31. worth.  
But the Triumph saves 13.15 per cent. more than the Frue; hence  
the Triumph saves 136 x 17.88 per cent., or 153.88 per cent. of the  
total contents, or extracts more than 31. worth of gold from ore which  
never contained more than 21. worth. Who, after such conclusive  
remarks, can any longer doubt the invariable accuracy and truthful-  
ness of inventors?

The San Francisco agents of the Frue Vanning Machine Company  
are so convinced of their accuracy that they advertise:—Saves from  
40 to 100 per cent. more than any other concentrator. Concentra-  
tions are clean from the first working. The wear and tear are merely  
nominal. A machine can be seen in working order and ready to make  
tests. . . . As the result of a suit East against an End-Shake  
Machine (the Embrey), similar to the Triumph, the Frue Vanning  
Machine Company owns the Embrey patent, and can put in the  
market an End-Shake machine of earlier patent that will do as good  
work as the Triumph, and superior in construction and durability.  
There will be no risk of suit for infringement. The Frue Vanning  
Machine Company warn the public that they claim and will prove  
the Triumph machine to be an infringement on patents owned by  
them. . . . N.B.—We are and have been ready at any time to  
make a competitive trial against the Triumph or any other concen-  
trator for stakes of \$1000.

The Joshua Hendy Machine Works advertise:—The \$1000 challenge  
accepted. . . . In a competitive trial recently had between two  
of the Triumph ore concentrators and the same number of Frue van-  
ning machines, at the mill of the celebrated gold-producing Original  
Empire Mill and Mining Company, in Grass Valley, Nevada County,  
Cal., the Triumphs produced 13.15 per cent. more concentration than  
did the Frue vanners, during a run of 24 consecutive days, or a net  
gold coin result of \$199.15, or 88.30 per day, in favour of the two  
Triumph concentrators. These returns do not include the value of  
the amalgam saved by the Triumphs during the test, which will add  
to the net gain. The form of construction of the feed bowl is such  
that considerable amalgam is necessarily saved, which is lost on the  
Frue vanner. This trial was conducted under the personal super-  
vision of the manager and superintendent of that company in a  
strictly fair and impartial manner, and with the sole view of deter-  
mining, in the interest of that company, the merits and demerits of

the respective machines by a thoroughly practical test. A relation  
of the course of procedure, a concise analysis of assays, and a ta-  
bulated statement of the net bullion results, with accurate deductions  
therefrom, will soon be published in circular form. The superiority  
of the present construction of the Triumph over the form originally  
introduced, together with the demonstrated results of the above and  
other trials had with the Frue vanners, induce us to and we hereby  
accept the challenge of \$1000 flaunted by the agents of the Frue  
Vanning Machine Company, and hold ourselves in readiness to enter  
into a second competitive trial for that sum at such place and upon  
such terms and conditions as may hereafter be mutually arranged.  
We guarantee purchasers against all costs, expenses, or charges in-  
curred by reason of any infringement of any existing patents. "Put  
up or shut up," and "let the best machine win."

Now, the Frue machine is a handsome piece of apparatus, and is  
altogether more elaborate, so that \$25 extra cost is not surprising,  
while the Triumph is much less to look at, and can, therefore, pro-  
bably be sold at \$25 less without compelling the maker to accept less  
profit. May the Hendy people's wish be realised—"Let the best  
machine win."

MR. HALLIBURTON, Q.C.—The Athenaeum recently announced  
that R. G. Halliburton, Q.C., of Canada, eldest son of the author of  
"Sam Slick," intended in a few months to visit Borneo, Fiji, New  
Zealand, and Australia, "for the purpose of completing the ethno-  
logical enquiries upon which he has been engaged for many years."  
A correspondent writes to me:—"I cannot deny that 'Sam Slick,'  
jun." (the *nom-de-plume* under which he has so frequently con-  
tributed to Blackwood), possesses the true literary vein; but,  
unlike the 'Old Clockmaker,' his father, or like Casaubon in 'Middle-  
march,' he is in danger of getting engulfed in the very volu-  
minousness of his own material. It is now over seven years since he  
showed me (in his charming retreat in the Dingle, Nova Scotia)  
some details of the extensive work he has laid his heart upon  
executing, and I said then, as I say now, that he is running the risk  
of a fruitless life-study in trying to attain an impossible thorough-  
ness. Mr. Halliburton aims at showing that most of the folk-  
customs, stories, and traditions of the whole world are substantially  
identical (a similar feat to that which Grimm has accomplished in  
demonstrating the law of the transmutation of the consonant in  
Indo-European languages); but it seems to me that life is too short  
for Mr. Halliburton to master his subject with that completeness he  
has set before him. His studies in Phallic worship are simply  
stupendous, and as I have since had the opportunity, during a  
lengthened residence in India, of verifying some of the facts he  
then indicated to me, I would advise him to publish his book first,  
and visit Borneo, &c., afterwards."—*Truth*.

COAL PRODUCTION IN NEW SOUTH WALES.—The total output  
of the New South Wales Collieries for 1883 exceeded 2,500,000 tons,  
the exact figures—2,521,457 tons 1 cwt.—being 412,175 tons in excess  
of the output for 1882. The average price per ton in 1883 being  
9s. 6 40d., as against 8s. 11 97d. per ton in 1882. A large quantity of  
coal is annually exported, even to England, and the inferior kinds in  
the inland districts are said to be quite as well fitted for immediate  
local use, as a great many coals worked in Great Britain, France,  
United States of America, and elsewhere, and to be especially suit-  
able for smelting purposes.

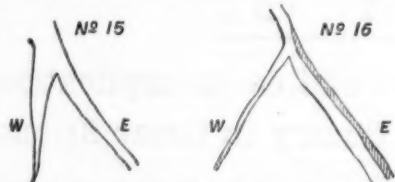


## Original Correspondence.

## THE GOLDEN QUARTZ REEFS OF AUSTRALIA.—No. IV.

SIR.—Reefs.—In 1869 the Garden Gully United Mine was let to a tribute company for five years at 17½ per cent. In the early part of 1871 no gold had been struck, although vigorous mining had been carried on; but that event was not far off, and subsequently in one month the tribute company obtained 250,000l. worth of gold, the average yield of gold from many crushings being quite 20 ozs. per ton of quartz. Very large profits have been obtained (as will be seen further on) by the Garden Gully United Company, but not without careful management, which reflects the greatest credit on the directors and mining manager (Mr. John Keam). Because they had a rich mine money has not been squandered as has, unfortunately, too often been the case in other rich quartz mines; on the contrary, every item of expenditure has been well considered, and more care and thought has been bestowed on the judicious laying out of shafts and pence than is the case in but few unproductive call-making mines. Much of this desirable state of affairs is no doubt due to the fact that Mr. George Lansell (our richest quartz gold miner, who is now enjoying a well-earned rest in England) holds a very large portion of the shares in this mine. This gentleman has been most successful in his quartz mining enterprises on Bendigo. He owns extensive private mines and very large interests in many public companies there, and it is a well-known fact that he may buy but he rarely, if ever, sells shares. Where his interests are large, the mines are all worked for legitimate profits and the yield equalised; the share market is left out of consideration. Mr. Lansell is the king of Australian gold miners. The Bendigo gold fields must remain under an everlasting obligation to him. His faith in the continuance of profitable quartz reefs at great depths has been tested and proved by his determination to discover and work them. He erected splendid winding machinery capable of winding at below 2000 ft., fixed air compressors to sink shafts with boring machines, and thus induced other investors in mining with the same confidence that he had himself in the deep ground. Furthermore, he offered a reward of 2000l. for the first shaft that reached a vertical depth of 2000 ft. on the Bendigo gold field, and placed the money in a local bank in trust for a certain period. His shaft on the Victoria Reef was the first to attain that depth, but he was not without competitors—the Victoria and Pandora, on the Garden Gully Reef, is 1873 ft. in depth, and there are half a dozen other shafts below 1500 ft. in depth. Mr. Lansell and many others had to fight against the faint-hearted sceptics who had no faith in the deep ground, and these sceptics were in the majority in the early period of quartz mining in Victoria, and are so now in more than one colony in Australia. Many of these faint-hearted men are to-day reaping, and have in the past reaped, rich rewards where they did not sow. I have only done part justice to Mr. Lansell's magnificent public spirit—quite exceptional in the annals of mining—but I shall refer again to his deep mining operations when I describe the New Chum and Victoria line of reef.

The main shaft of the Garden Gully United Company is now more than 1262 ft. in depth, and is still sinking. The second reef below the surface at the south end of the Garden Gully Mine possesses a peculiar saddle and west leg (No. 15). The latter is nearly wedge-shaped and vertical. The western portion of the east leg next the saddle yielded up to 50 ozs. of gold to the ton. The hanging-wall of



this east leg consisted of soft black carbonaceous slate, with pyrites and quartz veins, and the leg averages 10 ft. in thickness. This same reef near the No. 2 shaft, 500 ft. north of the No. 3 shaft, gets into sandstone strata, and the reef is pinched and irregular, especially in its saddle. The hanging-wall consists of a thin layer of black slate, then a layer of sandstone about 2 ft. in thickness (shown in section No. 16 by vertical bars or lines), then another thin layer of black slate and the true sandstone wall. The eastern leg of this reef has been for nearly a mile up to this point the most important leg; but now these circumstances begin to reverse, the west leg grows in width and becomes rich in gold, and eventually the only leg of the reef that is worth working, or, indeed, of size. The eastern leg is only indicated by a "track" line in many cases. We have also approached near to the southern extremity of the "lava dyke." At about 900 ft. still further north the eastern leg of the reef is rather irregular in underlie, and averages over 2 ft. in thickness; the western leg is just 2 ft. thick at the saddle, it underlies very regularly to the west at an angle of 66°, whilst the footwall gradually draws into the hanging-wall, and forms a wedge-shaped leg of quartz. The average underlie of the eastern leg is about 58°, which angles indicate that the middle reefs still have the top list to the west. On the hanging-wall of the west leg there is nearly 1 ft. of soft black slate. This leg for nearly 100 ft. in depth yielded profitable work. But we have got beyond the northern boundary of the Garden Gully United Mine, and I should not pass from it without giving a few particulars of the results obtained by mining within this property. There are 33,517 shares in this company, on which 12s. 11d. has been called up out of 90s., and the large sum of 824,123l. (to Aug. 3, 1884) has been paid in dividends. Dividends are regularly made every fortnight, ranging from 1s. per share upwards. Such is the outcome of mining a piece of ground on the Garden Gully line of reef, which, although crossed by the main Krong road to the principal quartz reefs of Bendigo, and traversed consequently by thousands of miners, yet for years was not considered worthy of either the expenditure of much time by miners or money by capitalists to test its value. I have no doubt there are like areas still on Bendigo neglected this day that will in another decade or two yield up their millions of pounds of gold.

Deep Mining.—In 1871 I wrote the following:—"Many thoughtful men not ten years since believed that the Bendigo reefs were worked out, but few in 1871 would state that the district has seen its best days. The weight of evidence is in favour of the future prosperity of this gold field being better than the past, and the bare possibility of the working out of the reefs we may safely leave to the consideration of future generations." In the early part of this same year I wrote:—"There is, indeed, far more reason to suppose that quartz mining will be successfully carried on at 1500 ft. than there was for imagining ten years since that we should be working 600 ft. beneath the grass. We have already gone 900 ft. in one instance, and shafts of 600 ft. and 700 ft. are becoming numerous, and at this rate we may assume that gold mining will be a national industry for generations to come." In September, 1875, I wrote:—"The same reasoning which applied to the above quotation . . . that quartz mining will be successfully carried on at 1500 ft. in depth, &c. . . may equally now be applied to mining at 2000 ft., or even 2500 ft. below surface." I wrote the latter remarks when the Magdala Company reported the discovery at Stawell of an auriferous quartz reef in the bottom of their shaft at 1680 ft. in depth. Quartz mining is being conducted profitably at the present date (Aug. 4, 1884) on Bendigo at the 1600 and at the 1700 ft. levels in one of Mr. Lansell's private mines, which I shall refer to in more detail in future. You might ask where was the necessity to argue and urge that quartz reefs would be found to exist and to contain gold in remunerative quantities at great depths? Because it was asserted that auriferous veins in other countries died out and became poor at shallow depths, and that such would be the case here likewise. This was stated by persons considered to be authorities, and they were supported, it is right to say, by a majority of the principal miners in Victoria of that period, including nearly all those men who had found and worked rich surface quartz reefs, the latter class carrying more weight with the public than they were entitled to. A lucky

"new chum" miner was . . . he is still, looked up to as a greater authority on all such mining matters than a man brought up to vein mining from his youth and having made it his sole study. No doubt these remarks will be read with interest by those persons who are engaged in gold mining in other countries, and whose operations have not yet reached below 200 or 300 ft. from the surface. They are decidedly encouraging; but it should not be overlooked that the deepest mining in Australia is carried on in the lower silurian in Victoria, and that the reefs therein are longer and wider and generally more permanent than is usually the case with those reefs that occur in the upper silurian strata. The reefs in the latter I hope to describe in the future, and I may mention that providing these possess certain characteristics, which I shall particularise, I believe a great number of the upper silurian reefs will prove permanent in depth and remunerative to work. The shaft of the Victoria and Pandora Company, next north of the Garden Gully United Company's Mine is now below 1873 ft. in depth. During the past half-year the Garden Gully United Company have crushed 7937 tons of quartz, which yielded 7202 ozs. of gold, and they divided amongst the shareholders 11s. per share, or 18,434l. in dividends. Up to Aug. 8, 1884, there has been paid to the shareholders this year 24,299l. 16s. 6d. During the past 13 years more than 200,000 tons of quartz have been raised and crushed from the reefs in this mine for a yield of 265,906 ozs. of gold, which realised when sold 1,056,953l.

Melbourne, Aug. 7.

WM. NICHOLAS, F.G.S.  
Consulting Mining Engineer.

## INDUSTRIAL RESOURCES OF NORTH CAROLINA.

SIR.—In enumerating the resources of North Carolina one hardly knows with what to begin. It is best, perhaps, to say what Nature has done for that State, and then enter briefly into the advantages offered to capital and immigration. From the Atlantic seacoast to the extreme west it is one continual rise, until in the Blue Ridge Mountains (the highest of which is 7000 ft.), we are on an average 5000 ft. above the level of the sea. Let us imagine then the climate that must result from such natural circumstances, and the idea at once given is that this long sloping stretch of land from the Blue Ridge Mountains to the Atlantic Ocean must give an even temperature, which is a noted fact in that State. In the extreme eastern part the months of July and August are disagreeably warm, the centre and western portion always maintaining an even temperature. The State is wonderfully adapted to the production of cotton, tobacco, corn, wheat, oats, vegetables of all kinds, peaches, apples, melons, pears, grapes, &c. Almost every known wood is found in the State in abundance. And as regards minerals it is simply beyond comprehension to think of finding in one state every known mineral, together with most of the gems, including the diamond. Gold, silver, copper, lead, and iron mines are to-day adding to the mineral of the world from its veins. Talc, soapstone, mica, corundum, and in fact all useful minerals abound here. With all these resources, then, why is the State considered poor? The answer is that the people are generally an easy class, that seem to care only to provide from year to year from their farms, leaving the principal products to the more ambitious to work out. Let us see, a party coming here with 1000l., and determined on agricultural pursuits, can purchase a 200 acre farm, and produce with two labourers in the year 400l. worth of tobacco, besides wheat, corn, vegetables, &c., sufficient for his support. Consequently, at the end of three years the party has paid for his farm, and has 200l. in hand. Cotton culture will pay in about the same proportion. Corn, wheat, and oats are always paying crops, but not so remunerative as cotton and tobacco. No other country in the world produces such a grade of tobacco as North Carolina, while in some of the counties is produced the finest wheat in the United States, weighing 66 lbs. to the bushel. Regarding the production of the woods, let me refer your readers to the manufacture of shuttle blocks from dog wood first; anyone taking up this business can purchase the wood land at 2l. or 3l. per acre, producing in many instances 100,000 shuttle blocks worth 1000l. In this business the first outlay is for the land and machinery (say) 300 acres and machinery with a capacity of 2000 blocks per day, which will cost about 1000l. Many other useful woods, such as oak, hickory black walnut, and pine, with capital will yield fortunes to the investors. At present many of these products, such as tobacco, cotton, wood, and minerals are being shipped north in the raw state for manufacture, which state of things must soon come to an end. With the advantages North Carolina offers to manufactures, capital is what is wanted to develop these resources. Labour is plenty and cheap. In October there will be at Raleigh, the capital of the State, an exposition displaying all the products and all data concerning them, together with a mineral exhibit that will astonish the world.

CORRESPONDENT.

## HYDRAULIC MINING IN CALIFORNIA, BRAZIL, AND SPAIN, AS VIEWED BY PRACTICAL MINERS.

SIR.—I have read with interest the paper of Mr. George O'Brien, published in the *Mining Journal* of Aug. 16, and while making some criticisms upon it shall offer some additional information on the subject.—1. Mr. O'Brien says that an hydraulic mine "cannot be properly tested until the water arrives upon it." Some years ago I used a very effective test in certain rich placer mines in this State. By means of common augurs I tapped the ground at several points from surface to bed-rock, and washed the contents in pans at the banks of a subjacent stream; the results, as shown by the subsequent workings of the mine, were entirely reliable.—2. In giving directions as to the manner of opening a hydraulic claim, Mr. O'Brien, by assuming the presence of white cement, ancient channel, original silt, blue gravel, appears to have only seen one mine; that one in which such materials or formations were found to exist. There are hydraulic or placer mines in which, while there is plenty of gold, there are none of the formations he mentions. There are placer mines in many parts of this State which are not upon ancient channels, and there are others in South America and Spain. Some of them contain blue gravel, others not. He says the pressure of the water depends on the volume deposited in a reservoir. It depends on quantity and altitude. There may be no reservoir at all, as in the Hathaway Mine at Scotchman's Creek. He assumes—from what he knows of the one mine he has seen—that the water is always brought all the way in iron pipes. Sometimes, indeed most frequently, it is brought in open ditches until quite near the mine.

In a hydraulic mine which I opened in Brazil the water was brought four miles by ditch, and only 1500 ft. of pipe was used. I, however, agree with him, that in many cases iron pipes are preferable to ditches, and they are certainly better than wooden aqueducts or flumes, as we call them here. His expressions "15 cents of \$1," "22 cents of \$1," &c., are so odd as to be difficult to understand. One may as well say "7½ pence of 1l. sterling," "11 pence of 1l. sterling," &c. His assumption that a tunnel is necessary to an hydraulic mine is quite a mistaken one. A tunnel is sometimes needed, in most cases it is not. I have seen hundreds of placer mines in this State, and hundreds of others in South America, Spain, and other countries, which either have been, or might easily have been, worked by the hydraulic system, and which had no tunnels. A tunnel is only necessary where there is no continuous downward path for the water and debris from the bottom of the placer to the dumping ground or channel. In alluding to the use of canvas hose, Mr. O'Brien is behind the age. For many years past hydraulic miners here and elsewhere have used "goose necks," "monitors," "little giants," and other devices made entirely of metal. The latest improvement is the "giant" with "deflector" or "lever attachment." The "9 in. giant" has an inlet of 15 in., outlet 11 in., inside of nozzle butt 9 in. diameter; weight, 1050 lbs.; price about 100l.—3. He gives the cost of hydraulicing a placer mine at 22 cents (about 11d.) per cubic yard. There are numbers of dividend-paying hydraulic mines in this State which do not find that much gold in the gravel. The average cost per cubic yard for working the gravel in several well-known hydraulic mines was:—Dutch Flat and Smartsville, 1d. to 1½d. sterling; Town Hill Placer Company, 1½d.; Wisconsin Hill Placer Company, 1d.; Richardson Hill, 1½d.; Gold Run Placer Company, 1d. to 1½d.; Independence Hill Placer Company, 1d.; French Hill, 3d.; Light Claim, 1½d.; Chesnan Claim, 2½d.; Johnson, 1½d.; Licard, 2d.; North Bloomfield, 1½d. The mine from which Mr. O'Brien derived his exceptional

experience was an expensive and as viewed by modern lights, badly worked property, which has ceased operations for many years. It was opened in 1855, commenced paying dividends in 1864, paid \$643,000 in dividends up to 1869, and then stopped. In its latter days it was a mere slave to the Excelsior Water Company. The Blue Gravel Company belonged to the infancy of hydraulic mining, and the experience which Mr. O'Brien says he derived from it has now but little value. I am not impugning his ability as a miner, only the practical value of his paper on hydraulic mining.—3. And now to other matters connected with hydraulic mines. In the early days of hydraulicing—that is to say, about 10 years ago, when a placer claim was out of grade it was often abandoned as practically valueless. Now, we use a device called an elevator, which employs the water to force the gravel up an inclined plane over the rim rock, and washes it in its path downward to the dump. In those days we used valves in the water pipes. Sometimes these got out of order, as they did in the Colombia Hydraulic of South America, and in which my friend Weldon lost several thousand feet of pipe by collapse. Nowadays we dispense with valves altogether. Time was when if the water for a placer mine could not be got from an elevation the mine was deemed worthless. Since then the North Fork Company, at Dutch Hill, and the Vermillion Gravel Company, at Forbestown, have washed their claims with water that was pumped up to the required level, and both of them made money by the operation.—San Francisco, Sept. 6.

ALEX. DEL MAR, M.E.

## NEW HOLMBUSH MINE.

SIR.—As there has been much talk of late respecting reported improvements in different parts of this mine, I felt very anxious to go underground and see for myself if such was the case. Accordingly, with the consent of the managing director and Capt. Bennett, I went below and am pleased to say found a stope in the bottom of the 145 with a lode that will yield 10 tons of arsenical mundic per fathom. There is a rise from this stope in a direction to meet a winze coming down from the 120 fm. level, which when completed will well ventilate this part of the mine, and lay open thousands of fathoms of valuable ground for stoping. The lead lode in this level is 6 ft. wide, and produces a large quantity of flour spar for which there is a ready sale at 1l. 6s. per ton. The lead found in this lode with the flour is not a leader, but occurs in lumps or nuggets, varying in size from ½ oz. to many hundredweights. I saw one there that was broken some years ago when I worked there as a tributer, which was 17 cwt. In the 160 fm. level there has very recently been driven a cross-cut intersecting the Flapjack lode where it proved to be 5 ft. wide, and 15 in. of the lode is fully one-half copper ore, while the other part is very rich in arsenic. They are driving both ways at this point with the Climax rock drill, and it is thought the lode will produce 20 tons per fathom. There is a winze in course of construction from the 145 level to this (160) which will be completed in three months, when there will be a current of fresh air from the surface to this level. If the manager can continue driving these two ends until they meet without being compelled to commence stoping the backs he would then be able by the quantity he would return to surprise even the most sanguine. On the 175 fm. level, with the use of the Climax drill, about 9 fms. progress has been made upon a lode that will average for ore 9 in. wide. This is what is known as the Holmbush old lode, and is ore of a very high percentage. The driving at present is in a cross-course which, as old miners in this district know, frequently occur in this lode. I would strongly recommend that this level be not stoped for the next three months. A winze sunk by former miners exists in front of the present end about 9 fms. below the 160, which would be struck with about three months' driving. These three winzes which I have mentioned would give a splendid supply of air from the surface to the bottom of the mine. I hope the company will hold on a few months longer without calling outsiders to join them, when I trust they will be in a position to pay dividends.—Callington, Sept. 18.

JNO. BUCKINGHAM.

## FOREIGN MINING AND METALLURGY.

Affairs appear to be going from bad to worse in the French Iron Trade—in this sense that prices have again begun to fall. The latest quotation for merchants' iron is 6l. 4s. per ton. The future is regarded with so little confidence that contracts are being entered into for next year at the extremely low rates now current. Stocks are certainly too considerable to admit of any improvement in price for some time to come. In the Longwy group production has been reduced by one-half, and the movement appears to be spreading. The Orleans Railway Company have ordered 300 steel tyres from the Commentry Company, at a price of about 9l. 4s. per ton. The Terrenoire Works has received an order for the plates required for the construction of a Spanish ironclad. The Naval Steelworks Company has received an order for cannon to the amount of 28,000l. The German iron trade has presented no material change. A Silesian Company has obtained an order for 78,000 steel sleepers at 6l. 4s. per ton. The Bochum Company has taken 41,000 pairs of fish-plates at 6l. 11s. 2d. per ton. An Esslingen house has taken a contract at Elberfeld for 11 goods locomotives at 1675l. each. The house of Kuehlin, of Mulhouse, has taken five smaller engines at 1365l. each. The exports of pig from Germany in the first seven months of this year amounted to 134,176 tons.

An adjudication for trucks has just taken place in Belgium. As was to be expected, the tenders submitted ruled very low. Quotations for pig have not varied upon the Belgian markets. Casting has made 2l. 2s. 6d. per ton. Charleroi casting pig has brought 2l. 14s. per ton. The Athus establishment has sold all its production for the remainder of the year; one of the Athus furnaces, it may be added, is about to be blown-out, after a brilliant campaign of 11 years. Hard refining pig has made 2l. per ton; ordinary ditto, 1l. 16s. per ton; and mixed ditto, 1l. 12s. per ton. No. 1 iron has made 4l. 10s. per ton for exportation, and 4l. 12s. per ton for home consumption; No. 2 has brought 4l. 16s. per ton; No. 3, 5l. 2s. per ton; girders, 4l. 16s. to 5l. per ton; No. 2 plates have made 6l. 4s. per ton; No. 3, 7l. per ton; and plates of commerce, 8l. 12s. per ton. The Acoz Company has just concluded a contract for a portion of 218 bridges about to be constructed in Java by the Dutch-Indian Government. The demand for iron minerals at Bilbao (Spain) has been scarcely so active of late. During the first eight months of this year the exports amounted to 2,126,866 tons, as compared with 2,368,397 tons in the corresponding period of 1883. The Rodange Blast Furnaces Company will pay a dividend of 1l. 8s. per share on Oct. 1.

Prices have been pretty well sustained upon the Belgian markets for coal of all descriptions. The current sale does not lack activity, and supplies are being laid in for the winter. Industrial coal has been in rather less demand, but transactions have preserved a tolerable importance, having regard to the generally depressed state of affairs. Quotations have remained generally unchanged. There has been no variation in the Couchant de Mons; a reduction of 2½d. per ton announced in connection with certain important contracts appears to be established as a general rule. Coke has shown more and more depression; a quotation of 10s. 5d. per ton is regarded at Liège as the lowest limit. The Mariemont Collieries Company has concluded a contract with the French naval authorities for the supply of the ships destined for Tonquin. There has been a considerable movement of coal of late over the Belgian State Railways. The number of trucks carrying coal and coke which passed over the system in the week ending Sept. 14 was 18,802, as compared with 18,562 tons in the corresponding period of 1883, showing an increase of 240 this year. The production of coal has remained very considerable in Germany, and some difficulty has been experienced in consequence in disposing of the whole of it. There has not, however, been much to complain of in the general tone of business.

IRON AND MANGANIFEROUS ORES.—Mr. E. S. FERGUSON (Cardiff, Sept. 24) writes:—There is very little business doing in the iron ore market. Freight from Bilbao have advanced further, consequent on the more stringent quarantine regulations in force in Spain. Ironmasters say they cannot pay the prices asked by sellers on account of the depression in the manufactured trades, and prefer consuming their stocks in the expectation of the quarantine being removed as the winter approaches. Prices of Bilbao, Rubio, or Dido ore are quoted at 12s. per ton c.i.f. Cardiff. Freight from Bilbao are 6s.



## A NEGLECTED MINERAL DISTRICT.

The Mutesarifik of Serres measures 40 hours in length by 30 in breadth. It is bounded on the Zichna side by the sandjack of Drama, on the Nevrocop side by Eastern Roumelia, on the Djouma Bala side by the Bulgarian Principality, on the Petrici side by the Caza of Stroumitza, and on the south side by the Gulf of Ruphani. It is surrounded and traversed by the mountains of Despotodagh, Rilodagh, Pirindagh, Kresna, Bosdagh, Pournardagh, and by the mountain chain of Lahana, Nigrita-Crouchevo. The Caza of Nevrocop is watered by the Nevrocop Karason (Nestos). The Serres Karason traverses the sandjack of Serres from the boundaries of Bulgaria down to the Gulf of Ruphani. This district is watered besides by more or less considerable rivers, such as the Angista, Bistritza, and others. The largest of the numerous plains of this sandjack is the plain of Serres. Watered as it is by the Strymon, which forms the lakes of Tahinos and Boutcova, covered with villages, and hamlets, long, broad, and magnificent; and on account of its fertility it well deserves the name of Altin-Ovasi (Golden Plain) given to it by the Turks. There are meadows and summer and winter pasturage everywhere throughout it. The climate though severe in the northern part is very mild in the southern. The winter in Serres and the neighbourhood is rarely severe, and often there is no snow.

The mountains of Kresna, of Perin, and of that part of Despotodagh which belongs to the sandjack, are covered with rich forests of pine, oak, beech, and poplar. These forests furnish an abundance of firewood and building timber, and contain a considerable quantity of game, and numbers of skins of hares, foxes, wolves, jackals, polecats, beavers, wild cats, and other animals are obtained. Roe-deer, bears, and stags are shot in the mountains of Bosdagh and Nigrita and elsewhere. The other mountains are covered with brushwood and dwarf trees, and there are very few of them bare. The mountains in the neighbourhood of Serres and those of Crouchevo furnish charcoal. The produce of the latter is exported by sea. Unfortunately the careless way in which the forests are cut will, in a not very distant future, be the cause of a dearth of wood in the country. The rivers, streams, and lakes are full of different kinds of fish, such as eels, carp, bream, perch, and others. Pike weighing up to 200 kilos are caught sometimes in the Lake of Tahinos. The Government taxes for the right of fishing in the Strymon from Demir-Hissar to Yeni-Kioi, near Tchahagazi, including the Lakes of Tahinos and Boutcova amount to 1000l. per annum.

Land is divided into Erazi-Miriyé, Erazi-Mevkoufe, Erazi-Metrouké, and Mera. A duty of 5 per cent. is paid for Erazi-Miriyé land whenever there is a transfer of Tapou (title deeds)—i.e., a purchase or sale. The same duty is paid for the transfer of Mevkoufe land to its respective Vakoufs. The Terviet, however, of Hadji Evrenos levies only tithes. Another Vakouf, a Tekké, levies only tithes. The Erazi-Metrouké, or land formerly under water, is uncultivated. There is a considerable amount along the Karason, Angista, and elsewhere. Mera land consists of communal possessions; it has no title, but the possession of Min-el Cadem—i.e., Ab-Antiguo. It is pasture. All the peasants, Turks and Christians, possess land more or less. The greater part of the farms belong to the Turks, though the Christians possess a considerable number: 60 years ago there was not a single Christian who possessed a farm, now sales are easily effected between Turks and Christians. Several Turkish farms have passed completely or in small lots to Christians, and several are charged with mortgages. The mortgages are chiefly in the hands of Christians.

Generally speaking the sandjack of Serres presents a harrowing spectacle of the decay of industries, arts, and trades which were formerly in a flourishing condition. The principal centres of commerce are Serres, Djouma, near Serres, Demir-Hissar, Melenico, Djouma-Bala, Banako, Nevrocop, Alistrati, Nigrita, and Petrici. It is impossible to give the quantities and value of the goods imported. England and Austria furnish the majority of the imported articles; tissues of all sorts, yarns, and iron come from England; Austria supplies cotton and silk tissues, cloth, glassware, gold thread, fezes, ready-made clothes, and sugar; Switzerland supplies silk and cotton stuffs; France a few fancy articles, and Italy very little. The chief market from which the sandjack of Serres procures its goods is Salonica. Very few firms have their goods directly from the producing countries. The chief articles of export are cotton, tobacco, cereals, vegetables, wool, skins, leather, furs, silk, cocoons, opium, &c. The trade outlets for export are Ruphani for the cereals of Serres and Zichna, Cavalla for the vegetables of Raslog; for the tobacco of the whole sandjack and part of Zichna cotton Salonica is the main outlet. Both as regards imports and exports Serres has very little direct communication with foreign countries. Two or three firms send corn to England, amounting to about 10 shiploads per year, and one firm only ends skins and leather to Austria. The current money in commercial transactions is the gold Turkish lira and the silver Medjidieh. Foreign silver money has lately been prohibited. Foreign gold money is rare. There are very few exchanges on London and Vienna.

The sandjack of Serres does not possess a single ship; it has, however, a harbour, which could be of great use—that of Ruphani. If the project of rendering the Strymon navigable were carried out, and if roads were constructed leading to the port, Ruphani would become an important trading place. As the river would be confined to a bed some thousands of acres of ground now under water would be reclaimed and agriculture would profit; commerce also would be improved, but all attempts made to obtain permission to carry out this plan have failed. Some 20 years ago the Government began some works at Yenikioi, near the bridge. The inhabitants gave large assistance both in money and labour, but it was all a loss. The roads leading to Ruphani are very bad, especially in winter; however, even under the existing circumstances, in spite of the difficulty arising from the want of easy means of transport, in spite of the embarrassment in which the merchant often finds himself on account of his being unable to fix the price of transport, more than 15,000 quarters of corn have been exported from Ruphani during the last three months. There is not a single road in the whole sandjack, using the word as it is understood by people who have not visited this country. The roads, as one must use the word, even those which have most traffic, are rough and difficult, cut up by ditches and ravines and without bridges; they are in fact mere tracks: 15 years ago the Government undertook to make a road between Serres and Salonica. The inhabitants of Serres gave great assistance, but only 3 or 4 kiloms. of road were made after an immense expenditure, and even this strip of road ceased to exist after a short time. Last year work was begun afresh on this road, and something was done between Serres and Lahana, and bridges are being made, and in two months it will be possible to go on in a carriage on this part of the road; but hardly anything is being done between Lahana and Salonica. Another road is being made between Nevrocop and Cavalla via Drama. Here there are projects of making a carriage road between Serres and Ruphani, and roads are being actively made in the district of Demir-Hissar. Seven years ago an Italian engineer asked for the right of making a carriage road from Serres to Salonica. At the same time an Armenian, the son of Nubar Pasha, and an English capitalist surveyed the country, with the object of making a railway between Cavalla, Serres, and Demir-Hissar, but nothing has been done.

The Mutesarifik of Serres, depending on the vilayet of Salonica, is divided into eight districts—Serres, Zichna, Nevrocop, Raslog, Djouma-Bala, Melenico, Petrici, and Demir-Hissar—which are subdivided into numerous Madirliks. The chief town of the Mutesarifik is Serres, those of the other districts are Nevrocop, Djouma-Bala, Melenico, and Demir-Hissar for the districts of the same name, and Méemia for the district of Raslog, and Zelihova for that of Zichna. There is at Serres a Mehkemé, or court for the affairs of the Sheri (or the religious law), under the presidency of the court: a Bedayet, or Court of First Instance, also under the presidency of the Cadi, and divided into two sections, one civil and the other criminal; an administrative council (Medjlisi-Idare); and since the Treaty of Berlin, when the frontiers of the empire receded on this side, Serres has become the residence of a military commandant and court. There are Christians in the courts and in the administrative council, but always in a minority; thus in the latter the non-Musulman population is represented by three members. There are only two Christians among the six members of the Court of First Instance, one for each section. Of five members composing the tribunal of com-

merce there are only two Christians, one of whom receives a salary, and the other is a mere assistant. The public prosecutor is a Musulman. The Presidents and vice-Presidents of the Medjlis and of the tribunals, and the caimacams of the different districts, are Musulmans, and only some of the mudirs are Christians. Among the six members of the Beledirjeh, or municipality, there are two Christians.

The chief of the police at Serres is a major, and the police of the districts are commanded by captains and lieutenants. In the chief towns of the districts there are courts of Sheri, courts of Davi, and administrative councils. There is an appeal to the tribunals of Serres for judgments given in the civil tribunals and assize courts of the districts. The mudirs act in the capacity of justices of the peace. There are municipal councils in all the chief towns of the districts; nevertheless, the country is none the better for them. The prisons everywhere are in a very wretched condition. The selection of officials is often unfortunate. To say nothing about other failings and the want of knowledge in the different branches of the service, there have been here a major of police and a cadi who could not read nor write. The present vice-President of the Municipal Council of Serres, who often takes the place of the President, cannot read or write. From time to time tribunals are inspected by an inspector, but it seems he finds nothing needing change. Great Britain and Austria are represented in Serres by vice-consulates, Greece by a consulate, Italy by a consular agency, and Persia by a consular dragoman. With the exception of the Greek Consul, who is a native of Greece, the rest are natives of the country.

It is certain that the sandjack is very rich in mines. Some concessions have been already granted, but they have not yet been worked vigorously. The coal mines of Serres are alone worked continuously. Lignite is extracted, and the bed is considerable. The method of working this mine is very defective, but as there is very little lignite consumed the working has to be done in a cheap manner. Lignite is sold at about 16s. per ton.

## REFORM OF PUBLIC COMPANIES LAW.

The necessity for certain modifications in the Companies Acts, in order to encourage enterprise and secure greater protection to capitalists, has frequently been pointed out in the *Mining Journal*, and attention has again been prominently drawn to the subject in the Economy and Trade Section at the Social Science Congress. The special question was—What have been the effects of the Limited Liability Acts on Industry, and are any amendments required? Mr. LATHOM BROWNE, after discussing the effects of the Acts, suggested—1. The limitation of the borrowing powers of companies, and the registration of the debentures issued by them as provided in the case of railway companies.—2. The discouragement of large amounts of nominal capital by the increase of the registration fees until a fair amount of capital had been paid up, and in that case the return of all above those now demandable.—3. The prohibition of fixing the directors and their remuneration by the promoter, and the postponement of it until a working capital had been paid up, and then placing it in the power of the shareholders.—4. The legalising of the French system of *en commandite* by which the working director is under an unlimited liability so long as his co-directors and shareholders do not interfere with his management.—5. The adoption of the provisions in Mr. Chadwick's Bill of 1877 as to the allotment of shares.—6. His clauses as to the disclosures of contracts with promoters, and—7. The form of balance-sheet and profit and loss account proposed in that Bill. Prof. LEONE LEVI thought that it would be unwise to cripple the operations of public companies by limiting the powers of borrowing money.

The excessive charges of railways for carriage of goods, which is causing a good deal of indignation just now at our great manufacturing centres, was discussed in a paper by Mr. HICKMAN, J.P., of Wolverhampton. Speaking of Birmingham and South Staffordshire generally, he said that the district was served by three great railway companies, and had besides canal communication with London, Liverpool, Hull, and Gloucester; therefore, he thought that traders had a right to expect reasonable rates as compared with other districts. Comparing the rates for iron from Birmingham with those from the Staveley district, Leeds, and the Lancashire and Yorkshire districts generally it was shown that the Birmingham rates must be reduced about 25 per cent. to be proportionate, and a comparison with Middlesbrough showed a much more striking contrast. Six important firms were mentioned who in consequence of this were removing their works to the sea. Several instances were adduced of lower rates being charged on articles imported from abroad than on similar goods exported from this country. The best method of effecting a remedy was, he thought, by trying to convince the railway companies that it was to their interest to make common cause with the traders, and assist them to compete with districts more favourably situated for export. Failing this, they might still co-operate for the purpose of developing the canal system by applying steam power to the propulsion of the boats. A lengthy discussion followed, and Lord LYMINGTON, in summing up, said he was entirely opposed to the idea of the State purchasing the railways. He thought that the most practical suggestion made in the course of the discussion was to the effect that the powers of the Railway Commissioners should be enlarged to enable them to deal with preferential rates, which operate unjustly, and to secure that canals should be perfectly free from railway influence.

**SCOTTISH MINERAL OIL TRADE.**—It is little more than 30 years since Mr. JAMES YOUNG began the Bathgate Oilworks, under his famous and much-contested patent, and only about 20 years since the first attempt was made to establish shale distilling works by Mr. Robert Bell, at Broxburn. Since then the industry has grown, but it may yet be said to be in its infancy. Not less than 2,000,000l. have been invested in Scottish oilworks, most of which yields a handsome return. The annual value of the trade is now about 1,750,000l., and the number of persons who directly get their living by it cannot be fewer than 950. At the time the works were first started oil shale was quite neglected—if we exclude the famous Boghead—now pits exclusively devoted to its production, extend over the whole central region of Scotland, and the amount brought daily to the surface is not less than 5000 tons. The whole of this is distilled for the production of solid paraffin, paraffin oil, and collateral products yielding at the rate of 50,000,000 gallons of crude oil and 14,000 tons of sulphate of ammonia per annum. Keen competition has been aroused in America, and it is only by the most rigid economy and skilful working that the Scottish trade has been enabled to maintain its footing. Never were companies more keenly alive to the necessity of cheapening processes and improving products, and important improvements have been introduced, especially in distilling the shale and in the retorts for that purpose. But while many processes have been revolutionised, the most important and delicate series of operations in the refinery department—the fractional distillation—has remained practically in the state in which it was worked in connection with the original patent of Mr. Young. The great disadvantage, however, with Young's system is that there is no uniformity in any portion of the distillate, that the distillation is intermittent, a charge being worked off in about 36 hours, after which the cooled still has to be refilled and heated again. Mr. Norman M. Henderson, of the Broxburn Oil Company, has succeeded in solving the problem of continuous distillation and gaining at the same time important collateral advantages. The advantages claimed obviously on good grounds for the new Henderson system are that the stills once started work continuously, steadily, and uniformly for weeks or months without stoppage, impurities never accumulate in any still, but are constantly passing onwards from one to another until they reach the final residue or coking still; the quality of the products are much improved, the oil possesses more equal gravity and constant boiling point, and the paraffin scale is of a better colour, crisper, and more easily pressed than is the case with the ordinary method of fractionation. There is a saving of 50 per cent. in plant, and of about 60 per cent. in the working expenses of the new system. The necessity for repairs, and the danger of accidents to the stills, are greatly reduced, from the simple fact that they are rarely cooled down. The stills and plant used under the old method may be adapted to the new at quite a small cost.

## AMERICAN INSTITUTE OF MINING ENGINEERS.

The autumn meeting of members, held in Philadelphia on Sept. 2 and following days, appears to have been particularly interesting and enjoyable. In response to an invitation of the Franklin Institute Board of Managers many members and their ladies attended the opening ceremonies of the International Electrical Exhibition, and in the evening the business proceedings of the Institute, details of which are given in the New York Iron Age, commenced. The address of the PRESIDENT—Mr. J. C. Bayles—dealt rather with economic than technical subjects, considering the causes and effects of the industrial depression, and urging those who stand in controlling or advisory relations to the metallurgical industries to resist the tendency to lower the standards to meet low prices.

The first paper was "On Underground Electrical Conduits," by Mr. C. HENRY RONEY, of Philadelphia, who after alluding to the annoyances, dangers, and expenses of overhead wires, described the system adopted by the American and Philadelphia Sectional Electric Underground Company, which consists in laying cast-iron pipes, from 24 to 30 in. below the pavement. The pipe is hexagonal in section, and composed of top and bottom sections, and within it are shelves made of wire, and constructed so as to avoid the inconveniences of induction, dividing up the area into a number of compartments, each of which receives a number of wires. By means of small manholes any wire can be tapped to be conducted into the houses along the line. The largest size conduit laid, 16 in. wide, by 10 in. high, has a capacity of 3000 wires, and costs from \$5000 to \$6000 per mile. In the discussion which followed Mr. N. S. KEITH spoke with approval of the methods adopted, and urged the importance of the general subject of electrical communication for mining engineers and metallurgists.

A paper "On the Desilveration of Lead by Electrolysis," by Mr. N. S. KEITH, described the experimental plant built some months ago at Rome, N.Y., for treating the base bullion in a reverberatory furnace without submitting it to any refining except skimming it. The lead is tapped through a spout having a valve within the furnace, running it into a series of moulds on a rotating table, which are so constructed as to furnish thin plates weighing 75 lbs. each. While casting two copper strips are suspended in them, so that they are cast in the plates. These anodes are hung upon a frame arranged in concentric rings, having between them a space of 2 in., and holding 276 plates. The anode frame is lowered into vats made of asphaltic cement. The cathode frames are built up of 13 rings 2 in. apart, placed concentrically, the anode frame being lowered in such a way that the rings of plates pass between two adjoining rings of cathodes, leaving a space of 1 in. between them. The vats are filled with electrolyte, a solution of acetate of soda, in which is dissolved sulphate of lead. Scrapers pass between the anode plates and the cathodes. To provide the necessary circulation of the solution a system of pipes are laid on, which draw it off below and return it above. The current from the Edison dynamo machine passes into one vat through the centre by a 1½ in. round copper conductor, and is carried to the next vat after passing from anode to cathode. The current has been made as high as 1400 amperes, the production of lead being in proportion to the amperes. A current of 1000 amperes will dissolve the lead and deposit it at the rate of 10 to 11 lbs. per hour per vat.

"An Experiment in Coal Washing" was the title of a paper by Dr. THOMAS M. DROWN, in which he described a method of separating coal from its slaty and mineral admixture without the aid of jigging, by making use of the density of the mineral components. It is necessary to have a solution of a specific gravity greater than the coal and less than the slaty and mineral matter associated with it, and calcium chloride fulfils these conditions. A sample of coal was crushed and passed through a 20-in. sieve and treated with the calcium chloride solution of a specific gravity of 1.40. After stirring, the greater part rose to the surface, while a portion settled at the bottom. Another sample passed through a 60-in. sieve and treated with a like solution, but of specific gravity of 1.30, separated more freely. In practice the advantages of this method of purifying coal would be its promptness, and the cheapness and simplicity of the plant required. To determine how thoroughly the loss from calcium chloride adhering to the coal could be obviated, the following experiment was tried:—611 grammes of purified coal were allowed to drain for 15 minutes, and were then washed six times with 350 c.c., five minutes in each case being allowed for draining. The last amount remaining in the coal after the fifth washing is equivalent to 2½ lbs. of calcium chloride to the ton of coal. The dilute washwaters could be used for subsequent lixiviation, until they became sufficiently saturated to be still further concentrated by heat to the original density. During the discussion Mr. JOHN FULTON stated that the cost of washing preparatory to coking was 23 cents a ton, while the best coking coal, which needs no washing, can be obtained at \$300 an acre in the Connellsville district.

Mr. FRANK FIRMSTONE described a new charging bell, which is a modification of the Langen charging apparatus. During the discussion instances were quoted showing how great an effect upon the working of the furnace apparently unimportant changes in the condition and the dimensions of the charging apparatus may have.

An instructive account of the methods of coal mining in the Connellsville coke region was given by Mr. JOHN FULTON. He described the situation and outline of the basin, and the early methods of mining and the first efforts to sell coke for fuel. There were in that district at the present time 10,364 ovens, which furnished over 17 per cent. of all the coke in the United States. He went on to speak of the wasteful character of the old methods of mining, and yet, in spite of waste, he thought the supply of coal would last for the next two centuries, unless the rate of consumption should be increased very much. He referred to the varying qualities of Broad Top, Bennington, and Johnstown coke, concluding by describing the methods of propping the roof in the Connellsville mines.

## NOTES ON THE PATIO PROCESS.

Without going into the details of the process, Mr. STEFELD simply gave the expenses of management and material used, as obtained from particulars recently gathered in Mexico. It appears that the average assay per ton of silver ore was 17.11 ozs. of silver, and that in the course of treatment about 25 per cent. of the silver was lost. The ore is first pulverised, at an expense of \$1.03 per ton; then it is ground, costing \$2.06, and the expenses in subsequent treatment, including general office expenditures, bring the cost of reducing the ore to \$8.12 per ton. The loss of 25 per cent. in treating the ore, explained Mr. Stefeldt, appears extraordinarily large, and is apt to give an erroneous idea of the Patio process. In high grade ores the loss is much less. In that assaying 49 ozs. to the ton the loss is but a fraction over 5 per cent., and in 99-oz. ore it was 7 per cent. In view of the fact that mules are used to furnish power, the expense of \$8.12 per ton was considered rather low. There is very little wood in that section of the country (State of Zacatecas), and if steam-power were introduced there would be little fuel to supply the boilers. As regards coal, no satisfactory arrangements have yet been made by the Mexican Central Railroad Company, and the prevailing price (about \$22 per ton) thus precludes the possibility of successfully using it. The loss of mercury used in amalgamating was stated to be about 1 lb. per 7.4 ozs. of silver. A short discussion followed the reading of this paper.

Specimens of ferromanganese from furnace A of the Edgar Thomson Works, at Pittsburgh, were exhibited by Capt. W. R. Jones. From figures given it appears that the proportion of manganese was exceedingly high, varying from 84 to 92 per cent., with from 6½ to 7 per cent. of carbon, 0.14 per cent. of phosphorus, and 0.25 per cent. silicon. The metal is made from Virginia ores.

**EXPERIMENTS WITH A STRAIGHT OR NO-BOSH BLAST-FURNACE.** Mr. HARTMAN, of Philadelphia, read Mr. W. J. Taylor's paper on this subject, in which it is said:—It is perhaps more important to put on record the particulars of experiments that are decided failures than those that are a success, as those of the latter class are certain to live, while the former may be lost sight of in a short time and repeated by others. To this end I propose to give the particulars of the trial of a straight or no-bosh furnace just made at the Chester (N.J.) Furnace, which was such a decided failure as to leave no doubt



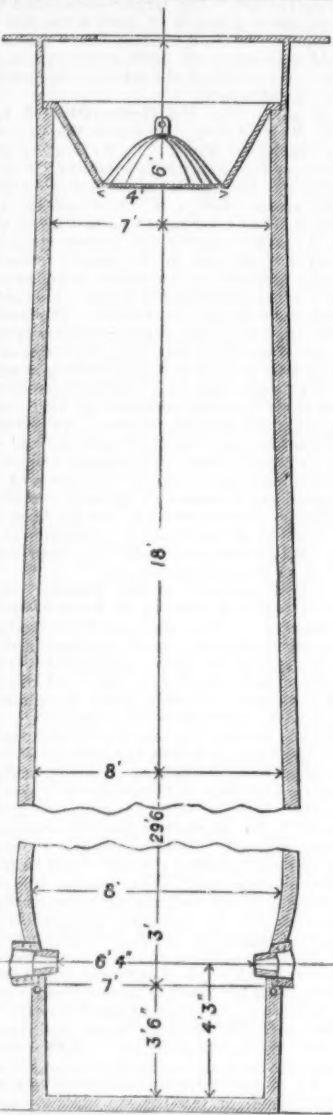
of the plan being wrong, and determining the necessity of a blast of some kind, as of old.

Some experiences during the past year led me to suppose that the hosh or belly of a furnace was unnecessary, and that the contraction of the walls towards the bottom for the stock to wedge in its descent facilitated dirty walls and scaffolding, hence irregularity and high fuel. I concluded, however, that a very shallow hosh for a skewback support to the stock would be necessary, and that the proper place for this was in the tuyere section, beginning just below the tuyeres and ending just above them, where there is nothing in the solid state but fuel, which is being consumed, and no slipping or travel of stock takes place. The cubical capacity of a furnace of this design would necessarily be much less than in the old style, unless it was made very much higher. But I assumed that the loss of room for reduction could be overcome by making the size of the ore and stone charged much smaller, so that the gases would act more quickly. The next point was what should be the size of the shaft, crucible, tuyere circle, and tunnel head for a given quantity of air.

My first design was 12 ft. diameter of shaft for 7000 ft. of air, with a 9-ft. crucible, and 8-ft. tuyere circle. This I soon reduced to 8-ft. shaft diameter, which I concluded was large enough for economical work if regular travel of the stock on the walls could be maintained. I consulted with a number of experienced furnace-men and furnace engineers, and the plan was well thought of by many of them, and as I had also some offers of financial aid from them toward the risk of trying the experiment, my firm concluded to make the trial in their Chester Furnace, which was 13 ft. by 60 ft., blowing 7000 ft. of air maximum. The furnace was lined accordingly, the shaft 8 ft. for 36 ft. up, and drawn to 7 ft. at the stock line, bell 4 ft., crucible 7 ft., tuyere circle 6 ft. 4 in., all as shown in cut. The lines of the lower part of the furnace for 14 ft. above the tuyeres were held by vertical water-pipes 7 in. apart, with 8 in. of brick inside, and one horizontal pipe just underneath the tuyeres. The furnace was filled about in the usual way—fuel, half coke and half anthracite—and fired at 8 A.M., July 17. Burned well by fanning with the engine, and blast was put on and bell closed at 2 P.M. Commenced blowing with 3400 ft. of air through four 5 in. tuyeres. The oven (winner suspended pipe) had been well fired with wood, and the heat came up well, but the gas was thin and cold from the start. Pressure light, less than 1 lb. for the first hour, but went up normally, and stock settled pretty regularly until about 6 P.M., when very decided irregularities commenced. Pressure very high at times, no gas and stock not settling. Temperature of blast at 6.30 P.M. was 600°. From this time the furnace could only be eased by throwing off the blast, when the pressure would tighten, gas come, and stock settle occasionally. On throwing on blast at 11.16 P.M. burst one of the pipes in oven, and stopped 29 hours for repairs. Oven had been fired, and heat came up rapidly on starting Saturday morning, July 19, at 3.40 A.M. Pressure 2 lbs., with 3400 ft. of air, and a small quantity of gas soon made its appearance at boilers and oven. Stock did not settle, however, and pressure soon went up, which was again relieved by throwing off blast. In this way the furnace was nursed until about 11 A.M., when stock settled well, and matters looked encouraging. Filled 7 tons coke as blanks, and got first flush of cinder at cinder notch at 3.15 P.M. Continued to work fairly well until 3 o'clock Sunday morning, when we cast five beds poor white iron. Furnace then tightened up, and gas disappeared. At 7 A.M. exploded five cartridges giant powder in the centre of the furnace, about 15 ft. above the tuyeres. This, together with throwing off the blast and not filling for a time when the stock settled, gradually brought the furnace into working shape again, but only for making a small quantity of white iron even with the low burden of one to one. On Monday, July 21, opened four test holes in walls 3 ft. above the tuyeres and found stock quite cold—only red hot—next to walls for about 2 ft. all round. This stock, consisting mainly of fuel, was principally fine, and appeared to be moving, but very slowly compared with the centre. We also opened holes 13 and 20 ft. above the tuyeres and found practically the same conditions—cold stock, but not specially fine, next to walls for about 2 ft. This showed only 4 ft. in diameter, or one quarter of the area of the furnace for active work and explained the whole trouble, and also proved that straight walls would not prevent accumulations on them or perhaps scaffolding. We then blew the furnace down to within 4 ft. of the tuyeres, when the walls cleaned themselves, and test-rods showed greatest heat next to the walls, but in filling up again the old troubles reappeared, stock settled irregularly and by jumps, particularly when furnace was nearly full. The accumulations on walls over tuyeres were the same, iron nothing but white unless blanks or very light burden was working, and even then we could make nothing better than grey forge.

After working in this irregular way for a few days we blew down again, and when a little more than half-way down found the stock active and hot on walls, and we commenced filling up again. First, 12 hours put in 18 tons of blanks with a slag and limestone burden only, then 20 tons blanks in next 12 hours with slag and scrap, but after putting on a light ore burden, three-quarters ore to one fuel, and before furnace was full, the old troubles came back, and we decided to blow out.

The duration of the blast was 16 days, and the product was 30 tons grey forge, 20 tons mottled, and 76 tons white iron; total, 126 tons, plus the scrap, which was, perhaps, 20 tons more than used. Stock used was 295 tons coal, 134 tons coke, 365 tons ore, 175 tons stone. Of course, much of the cinder was high in iron also, and was saved. These results were so decidedly unsatisfactory that they seemed almost accidental, and it was, therefore, concluded to make another trial before abandoning the plan entirely, by blowing in a little differently. The furnace was again filled, using a little more wood and considerable furnace slag with blanks and charges. No slag had been used in the first filling. Blast was again put on Aug. 13, after burning well for 134 hours natural draft, starting with 3300 ft. of air blown through 5 in. instead of 5 in. nozzles. In four hours the



furnace was in precisely the same conditions as in the first blast at the end of four hours' blowing, and as the following 24 hours was only a repetition of the first blast in all respects, notwithstanding the changes made in blowing in, it was decided to blow out at once, as there could be no doubt then but that the plan, at least if not a success, was a successful failure. He recorded his thanks to Mr. Hartman, of Philadelphia; Mr. Rader, of Sheridan; Mr. Cook, of Warwick; Mr. Firmstone, of Glendon; and Mr. Boyer, of Columbia, for their support and assistance in the trial.

In the discussion which followed the reading of this paper Dr. RAYMOND thought it desirable that some explanation for the failure should be offered. The unsatisfactory condition of the furnace was, in his opinion, brought about so quickly, especially as the lines of the furnace did not seem to warrant its expectation, that any further light thrown on the subject would prove highly interesting. Mr. W. F. DUFFEE, of Bridgeport, Conn., referred to the circumstance that, if we fill a cylindrical tube with sand, the descent of the latter will, after a short time, be completely arrested by the formation of arches having their abutments at the walls of the tube. In the furnace considered the variation in internal diameter was so slight as to make it almost cylindrical, and the failure might possibly have been partly due to this fact. Appreciable increase in diameter, however, would reduce the tendency to scaffold. This view was supported by Mr. JOHN BIRKINBINE, who referred also to the practically slight differences between the lines of the anthracite and coke furnaces and those of the old charcoal furnace and that forming the subject of Mr. Taylor's experiment. Mr. HARTMAN stated that short stoppages of the blowing engine which occurred, and were due to a heated crank pin and a hot eccentric strap, caused rapid and appreciable reduction in temperature of the fusion zone, and the metal solidified, and by the weight of the superincumbent mass was compressed and forced against the furnace walls, to which it became firmly attached. Speaking of scaffolding, Dr. RAYMOND alluded to the effects of irregular streams of gases forming gas channels, which induced burning of the fuel above the half-melted stock, and thus favoured the formation of hard rings in the furnace. After further discussion by Messrs. Eckley B. Cox and J. C. Bayles, a paper on the "Deep River Coal Beds of North Carolina," by Dr. H. M. CHANCE was read. He said that the Deep river was a branch of the Cape Fear river, and the beds along it are 30 miles in length, but very narrow. He did not believe that there was any connection between these beds and those of the Danville district. There were two deposits of workable coal—one 3 ft. thick, and one, 40 ft. below it, 2 ft. thick. Some of the coal found was anthracite, and it could be mined for \$1.30 per ton.

Mr. O. J. HEINRICH referred to the prospects of the ammonia soda process, which was steadily growing, as was shown by figures giving the output of soda of different countries and the number of tons made by the process.

**MINERAL STATISTICS OF VICTORIA.**—We are favoured by the Secretary of Mines, Mr. G. W. LANGTREE, with the reports of the Mining Surveyors and Registrars for the quarter ended June 30. During the quarter 29,075 miners were employed; of these 10,617 Europeans and 5524 Chinese were engaged in alluvial mining, and 12,804 Europeans and 130 Chinese in quartz mining. The value of the mining plant in use was 1,939,879. There were 1313½ square miles of auriferous ground actually worked upon, and 3764 distinct reefs proved to be auriferous. The total quantity of gold got during the quarter was—from alluvium, 74,996 ozs. 15 dwts. 10 grs.; from quartz, 115,221 ozs. 7 dwts. 14 grs.; total, 190,218 ozs. 3 dwts. The average yield of the quartz crushed was 9 dwts. 2.98 grs.; of the quartz tailings and mullock, 1 dwt. 13.25 grs.; and of the pyrites and blanketing operated upon, 2 ozs. 3 dwts. 20.51 grs. Mr. John F. Hansen, writing from the Blackwood division and Blue Mountain south sub-division, says—The report that a rich patch of alluvial gold has been dropped upon at Green Hills caused a good deal of excitement during the latter part of the quarter. From observations made recently he reports the character of the land to be of volcanic and schistose formation, the surface being of rich chocolate soil and well timbered. The Green Hill Creek is one of the main branches of the Krojanunip Creek, and the lessee carries on mining operations by means of ground sluicing. The shallow alluviums in the bed of the creek have been worked many years, and the very spot where the gold is being at present found was worked some six or seven years ago. The gold at present being obtained is from a quartz reef that traverses the area; it is from 3 to 4 ft. wide, and consists of quartz veins from 1 to 8 in. thick, intersected by sandstone and slate. The extraction of gold from quartz by means of ground sluicing is only a temporary arrangement until sufficient capital can be raised to erect a battery. A piece of quartz from the richest part yielded 1 to 1½ oz. of loose gold and gold specimens. In the Taradale and Kyneton districts Mr. Stephen Dorman reports that three additional quartz claims have obtained payable stone—the North Queen's, O'Connor's, and South Queen's. The yield of gold in this division exceeds that of last quarter by 1759 ozs., and the number of miners has increased by 150. Altogether mining has not been in so prosperous a state for many years. From the Sandhurst division Mr. Stephens writes—The New Chum and Victoria Company cut a small reef at 1560 ft., a trial crushing from which averaged 1 oz. to the ton. The northern deep claims on the New Chum line are being worked with renewed courage since the publication at the instance of the Mining Department of the returns from Lansell's No. 180 Mine.

**DYNAGRAPH CAR.**—The car perfected by P. H. DUDLEY for automatic or mechanical inspection of railroad tracks is very ingenious. By delicate machinery connected with the axle of the car by belts or rods every vibration, tilt, or pendicular variation in the position of the car is noted on paper with pens set for the purpose, and the record thus made is reduced on paper by the expert in charge, who thus far has been Mr. Dudley himself. Thus a complete and accurate chart of the track in profile and alignment may be submitted to the section superintendents, showing not only the amount and kind of work required to perfect the road, but also the precise places referred to mile-posts on the road where the work should be done. The registration of these machines is so perfect that Mr. Dudley can, if the rails are comparatively new, tell, when passing at the rate of 20 miles an hour over a railroad, what mills rolled the rails on which he is riding, and knows at once when passing from rails of one manufacturer to those rolled by a different maker.

From the record thus made Mr. Dudley makes up a profile map of the road, which, by curved lines shows, on a scale of ¼ in. to the mile, the following things:—1. Any irregularities of the gauge along the line.—2. Defects in horizontal alignment of the rails.—3. The grades along the railroad.—4. The condition of the track at any point, compared with a perfect track.—5. Whether and how much the track can be improved by labour, or whether new rails alone are needed to make it more perfect.—6. The brand and kind of rails used on each mile of road.—7. The number of years each rail has been in place.—8. The comparative percentage of tangents and curves per mile of road. This map, completed, costs \$2.50 per mile, the high price coming mainly from the immense amount of work required to interpret the results, and the delicacy and cost of the instruments used in the work. Mr. Dudley is the inventor of all his instruments, and inspects each year from 6000 to 10,000 miles of track, living on his car during these trips. From 3000 to 5000 "miles" of paper are kept in the car constantly, and 15 gallons of ink per 100 miles of track are used in "spotting" low places.

**IMPROVED STONE BREAKER.**—Messrs. S. Mason and Co., Leicester, have just been awarded at the Long Sutton Agricultural Show a silver medal for their New Patent Simplex Hammer Motion Stone or Ore Breaker, which has already been described in the Journal. It claims to be the simplest and most effective machine yet produced for the purpose, its chief advantages being that it has only five wearing parts. It takes 75 per cent. less oil than other machines of the same sort at present in use, and the wearing parts can be easily got at and kept clean. It will cube stone better than when broken by hand, and when the fine teeth jaw is put in and the movement of the swing jaw is set to ¼ in., it will hammer or crack the stone to the size of pens and wheat. The machine is calculated to supply a long felt want, not only of miners, but of stone and cement merchants.

#### GEOLOGICAL PHENOMENA—CHANGE OF WATERSHED.

So many are disposed to doubt the authenticity of geological hypotheses unless corresponding conditions can be shown to have obtained within historical times that the detailed reference to the gradual alteration of the watershed in the Val di Chiana, even by human agency between the 12th and 19th centuries, made in a recent communication from the Consul for the district, will be generally interesting. The Val di Chiana, from its northern limit to the south end of the Lake of Chiusi, is about 53 kiloms. in length, and on an average from 4 to 9 kiloms. wide. It is enclosed between two chains of mountains running nearly parallel to the meridian, the spurs of which, in the shape of rounded and fertile hills, extend irregularly into the valley, nearly the whole of which is under cultivation and maintains an industrious agricultural population chiefly scattered in numerous farmhouses, the hills being crowned with towns and villages. The numerous vestiges of ancient buildings attest the prosperity of the valley in early times. During the Roman period the Cassian way, passing down its length, formed the high road to Rome from Etruria. Now the railway which traverses the valley from Arezzo to Chiusi performs the same office.

More than 20 streams and torrents, some of considerable capacity, descend from the lateral mountains into the valley. The Val di Chiana is intersected longitudinally by a canal which carries its waters to the River Arno. This canal until Jan. 1 last was regulated by a lofty sluice known as the Chiusa dei Monaci, at its northern end, and is crossed near Valiano by a lock (callone) built in 1723, which regulates the upper waters formed at the southern extremity of the valley by the lakes of Chiusi and Montepulciano. The Chiana river appears to have been navigable by means of locks during the Roman period, and during the middle ages was the chief means of communication down the valley, when the principal villages obtained the name of Porti, showing the stations at which ferries crossed the water from one side of the valley to the other. The valley is placed between the River Arno on the north and the River Tiber on the south. Although situate for the greater part in the province of Arezzo its southern extremity is included in the province of Siena.

The Val di Chiana presents a very singular hydrographical phenomenon in the inversion of the natural course of its rivers and torrents which originally flowed from north to south—the Chiana river conveying them to the Paglia, an affluent of the Tiber, but which now have been made to turn in a contrary direction (south to north); the Chiana canal carrying them to the Arno. The causes which have rendered this inversion necessary may be briefly stated as follows:—At a point some 6 kiloms. to the north of the city of Arezzo, where it is joined by the torrent Chiasa, the River Arno having descended the valley of the Casentino makes an abrupt bend to the west, and carries its whole stream through a deeply-excavated bed into the upper valley of the Arno on its way to Florence. But this was not always the case, and as late as the beginning of the Christian era part of its waters continued to flow in a southerly direction, and leaving Arezzo on the east entered the Val di Chiana by a narrow pass known as the Goletta di Chiani, conveying all the waters of the valley to the River Paglia, from whence they joined the Tiber. It is possible, indeed, that at some more remote period this may have been the principal branch of the Arno; but as the obstacles to its free passage down the present Val d'Arno where overcome by the action of Nature or of art, as the level of the plains gradually rose while the bed of the river deepened this southern branch became of less importance, and gradually ceased to flow altogether. Stagnant waters appear, however, to have remained in part of the plain of Arezzo in the vicinity of the old bed of the river for a considerable period until they were finally drained into the Arno, which was probably completely effected towards the close of the 13th century.

Notwithstanding the loss of the determining power, the exact period of which appears uncertain, the waters of the Val di Chiana still continued to flow in their original direction from north to south, the valley retaining its ancient prosperity until, perhaps, some time in the 10th century. As, however, the waters slackened their stream, the deposits of mud from the torrents, which entered the valley from the lateral mountains, placed obstacles in the way of the current, and, little by little, the Chiana from a river became converted into a swamp, the northern end of the valley being the first affected; cultivated lands were covered with water, malaria arose, and the fertility and prosperity of the district were entirely destroyed. The very name of Chiana, indeed, ceased to be applied to a river, but was used to signify stagnant waters. Thus Pulci—

Tutto quel giorno cavalcato avieno  
Per varchi, per burron, per mille Chiane.

Between A.D. 1000 and 1300, therefore, little or no water appears to have flowed into the Val di Chiana; while it was not till a later date that a passage was opened for its waters into the Arno. In 1345 the Aretines decreed that the "fosso," or canal, of the Chiana, from the bridges of the Siena road (now called the Ponti d'Arezzo), should be enlarged and maintained as far as the Chianicella, to a distance of four miles, to permit the stagnant waters of the Chiana to enter the Arno more freely. In 1551 a general survey of the Val di Chiana was made, which showed that at that date the waters of the Chiana, from the Porto di Brolio, took their course towards the Tiber; from the Porto di Brolio to the Porto dei Pigli they were almost stagnant; and from the Porto dei Pigli upwards they flowed towards the Arno. In the course of two centuries, therefore, the canal would only appear to have been lengthened between one and two miles. Between 1591-99 the canal was further prolonged to Foliano (between nine and ten miles). At this date the Chiana waters flowed into the Tiber from the Ponte di Valiano, while between Valiano and Foliano they were stagnant, flowing from Foliano into the Arno. In 1870, after the concordat between the Tuscan and Papal Governments had been concluded, the waters of Chiana flowed into the Arno from the valley of the Tresa inclusively. Having thus briefly traced the course of the Chiana river during its various evolutions, it remains to notice the manner in which the valley has been drained and restored to health and fertility. Between 1525 and 1533 the greater part of the communities of the Val di Chiana made over their respective portions of marsh to Pope Clement VII. (Giulio dei Medici) that they might be drained and restored to cultivation. Various works were begun for the purpose of drying up the Chiane, but the death of Pope Clement, of Cardinal Ippolito dei Medici, and of Duke Alexander, together with the civil disturbances of the period, interrupted all the projects, and the great idea was not taken up again till 1551. In this year the general survey of the valley already mentioned, and which is cited by Fossombroni as a very remarkable work for the time, was made under the direction of Messrs. Antonio de Ricasoli, who, in 1533, had been appointed by Cosimo I., superintendent general of the works in the Chiana valley. According to this survey there were 5318 stiaioie of marsh lands in the Siennese territory, 38,150 stiaioie in that of Florence, and 12,766 stiaioie of marsh lands on the territory belonging to the Church that could be reclaimed. The marshes then commenced at a port called della Pieve a Toppo, on the road now leading to the bridges of Arezzo, and at this point the principal canal was begun by M. Antonio de Ricasoli.

From the bridge towards the south the marsh widened so that the stagnant waters were in some places two miles in breadth. After the Porto di Torrita the width diminished until, at Valiano, it did not exceed 1000 paces, to widen again between this point and the lakes of Montepulciano and Chiusi, where the waters were of a considerable depth. The levels of the valley are given in the survey which marks a rise of 71 braccia from the Arno to the Porto dei Pigli, a level run from the Porto dei Pigli to that of Foiano, and a fall of 68 braccia for the 28 miles intervening between the port of Foiano and the mill of Ficioli, in the neighbourhood of Carnaiolo. The survey shows the condition of the rivers and torrents in the valley at that period. The torrent Vingone, which originally entered the canal 470 paces below the Ponti della Nave, had been carried by M. Riccardi 1050 paces lower down. The River Lota received a contrary treatment. This torrent, which originally debouched a little above the Ponte della Nave, was turned in an opposite direction above the Pont della Pieve a Toppo. This change of direction must have had for its object the raising of the land by warping ("colmate"), for the torrent was turned into the old marshes which existed above this bridge. The River Foenna debouched above the



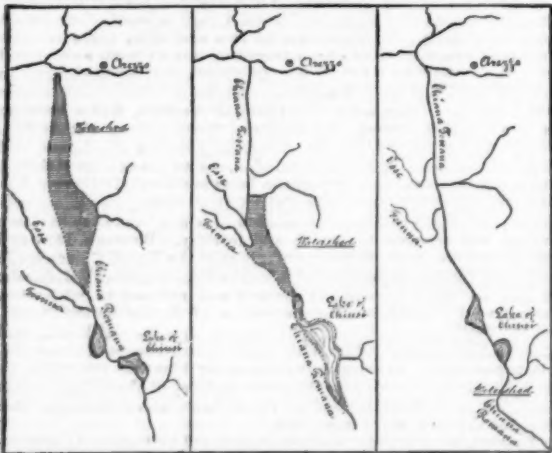
Porto Nuovo di Torrita, where the waters were wide and deep. The Salarno was divided into two branches; the first entered the marsh below the Osteria di Valiano, the second lower down, facing the confines of the territory of Cortona.

Various works for draining the marshes of the Chiana valley were carried on to the close of the 16th century, always, however, with the fear which had existed in the time of the Romans, when the turning of the Chiana from the Tiber into the Arno had first been mooted, that, if the waters of the Chiana were made to flow more rapidly into the Arno the floods might be increased to the danger of the capital. During this period and from this cause, the Chiusa, or Pescal de Monaci, was ruined and rebuilt several times, being at one time considered as a work of defence for Florence, at another as an obstacle to the reclamation of the Val di Chiana. Fertile lands, especially between Arezzo and Pigli—that portion of the valley which is in a position to profit more easily by drainage by means of a canal—were, however, reclaimed during this period, salubrity reappeared, and the merit of the works was especially attributed to the care of Ferdinand I., who often visited them, so that the grateful Arretines erected a marble statue to the prince with a laudatory inscription. In the 17th century, through the whole of the Val di Chiana, various works continued to be carried on both by the Grand Ducal and Papal authorities for the reclamation of the valley, but always disturbed by State jealousy and the usual dread of the Romans, on the one hand, that the increase in the waters of the Tiber might damage Rome; of the Tuscans, on the other, that Florence might suffer from an increase in the waters of the Arno. Numerous treaties and conventions were made at different times between the two Governments, but only to be broken.

In 1640 Enea Gaci da Castiglione communicated to Galileo his idea of removing the stagnant waters from the valley by drainage. His project consisted substantially in demolishing the Chiusa dei Monaci and prolonging the canal of the Chiana as far as the lake of Montepulciano, under the belief that by the destruction of the sluice he would have obtained a sufficient fall to carry off all the stagnant waters. Galileo's opinion on the subject is not known, and the project was neglected till 1645, after the war of Castro, when it was warmly espoused by the Marchese del Borro, an Arretine and one of the Tuscan generals, with the support of Don Famiano Michelini (Fra Francesco), Professor of Mathematics at the University of Pisa. The latter made a short report proposing the destruction of the Chiusa dei Monaci, with the establishment of locks at the Ponti d'Arezzo, to prevent a too rapid discharge of the waters. The proposition met with the approbation of Cardinal Leopold, brother of the Grand Duke Ferdinand; and the celebrated Torricelli, who had recently entered the service of the Medici as a mathematician, was consulted on the subject.

Torricelli was of opinion that the projected canal would not have the desired effect of draining the valley, the fall being insufficient, and that if even the drainage could be effected the benefit would be small, on account of the general depression of the land which would follow, and so render any advantage obtained temporary only. In an appendix to his reply Torricelli suggested the idea of proceeding by warping ("colmata"), or raising the soil by deposits, instead of draining off the water by a canal. The Senator Arrighetti, superintendent "Allo Scrittoio delle Possessioni," or Grand Ducal Estates, supported Torricelli's opinion, which was strongly combated by the Marchese del Borro. The Cardinal Leopold dei Medici, however, originally a partisan of the drainage project, was also founder of the celebrated "Accademia del Cimento," and felt the full force of Torricelli's opposition. The Chiana dei Monaci remained standing, and the idea of raising the level of the valley by warping took firm root. In 1653 the canal of the Chiana was, however, cleared out and widened, on a report of the engineer Alfonso Parigi, from the Chiusa to the Ponte di Valiano.

In 1691 the Florentine engineer, Giuliano Ciaccheri, profiting by Torricelli's opinion, availed himself of the stoppage ("ristagno") of the waters of the Chiana, which the Romans had induced from the usual fear of floods in the Tiber, to raise the lower lands by causing the River Parce, together with the waters of many minor torrents, such as the Monaco, Cerreto, and Fossatello, to overflow towards the Passo alla Querce, between the lakes of Montepulciano and Chiusi. The River Astrone was also made to overflow in the plain of the Cardelle, which runs under the Collina di Chiusi, and the results showed the truth of Torricelli's assertions as to the benefits to be derived from warping. These were still further confirmed in 1702, when the engineers, Pier Antonio Tosi and Giovanni Franchi changed the direction of all the torrents which enter the Chiana between Valiano and the Ponti d'Arezzo, thus not only reclaiming a large superficial area, but obtaining the additional advantage that the lateral torrents entered the Chiana Canal freed from the heavy deposits they had left in the reclaimed area, and so did not produce the shoals which had formerly contributed to render the canal inoperative for purposes of drainage. In 1718 a line of division was established by the Papal and Tuscan Ministries, from which the waters of the Chiana and its influents should be directed without obstacle either towards the south into the Tiber, or north into the Arno; but the convention was not carried out, and it was not till 1723 that the "Callone" of Valiano, which was to regulate the waters, was finished.



The advantages of following the system of warping were soon seen, it being calculated that between 1704 and 1736 about 46,128 stiaiores of land were reclaimed between Valiano and Arezzo, along the Canal Maestro, while even to the south of the "Callone" of Valiano land was rising. At the same time the current of the canal was quickened, and its depth, when other circumstances permitted, increased. In 1769 further improvements were effected in the Val di Chiana on plans drawn up by the engineer Perelli. The old Ponti d'Arezzo were demolished and rebuilt of a single arch, and the bed of the canal was reduced to a regular gradient. The canals of Chiarino and of the Passo alla Querce were dug to give an easier exit to the waters below the "Callone," while the mouths of the two turbid influents, Lota and Vingone, were brought a little above the Chiusa dei Monaci, so that the greater velocity which the torrent has at that point should enable the heavy deposits brought down by these torrents to be carried off; and, lastly, various regulations for carrying out the warpings were made, which might advantageously have been carried further.

Until the time of Fossombroni there was no general direction of the works of reclamation ("bonificazione") of the Val di Chiana. These appear to have been carried out independently by the various administrations holding local sway in the different districts of the valley. Thus one part was subject to Florence, another to Siena, a third was in the hands of the order of St. Stephen—which possessed a considerable extent of land, while the Grand Ducal Estates were under the direction of a separate administration known as the "Scrittoio delle Possessioni." At the present time all the estates of the valley are private property. Count Vittorio Fossombroni, the well-known

statesman and hydraulic engineer, was the first to propose a general plan of reclamation, of which the main principle was that the natural fall of the valley should be inverted, and from north to south be carried in a contrary direction. This was to be effected by turning the waters of the currents on to the low lands, which were to be raised by means of warping or "colmata." At the same time the direction of the torrents themselves was to be carefully regulated, so that they might debouch into the Central Canal, which conveys the waters of the valley to the Arno, in such a manner as to increase its scour, and cause it to assume in time the regular flow of a natural river.

A "colmata," or warping, is thus carried out:—The low-lying land which it is intended to raise is surrounded by a dyke. A regulator, formed of stakes interwoven with osier twigs, is constructed at an angle of the ground with a small wooden sluice-gate near it. The floods of the torrent fill the enclosed area, rise to the height of the regulator, and overflow into a second enclosure made in front of the first. The sluice-gate is only opened to let out the waters, which have deposited all their mud in the dyked enclosure. The size of each enclosure depends on the volume of water which the torrent can supply, the largest containing an area of 400,000 square feet. The duration of a "colmata" depends upon the amount of rainfall; the average is calculated at five years. In 1789, Count Fossombroni was placed by the Grand Duke Leopold II. at the head of an administration directed to a combined reclamation of the whole valley in accordance with his views. The works appear to have languished during the period of the French occupation of Tuscany, for we find that the Grand Duke Ferdinand III. established a local direction of the works of Arezzo, with Count Fossombroni at its head. In 1822 the new works of the Chiusa dei Monaci, which was rebuilt of hewn blocks, with a central opening 18 metres in width, were commenced.

About 1835 the results of the works of reclamation, carried out in the valley under his superintendence, are thus described by Count Fossombroni:—"The waters of the Chiana, from the Arno to the Chiusa dei Monaci, flow as a river, which tends continually to excavate its bed, from the Chiusa to the 'Callone' of Valiano. The canal runs longitudinally through the valley, but in general enjoys so slight a fall that the current cannot carry off the earthy deposits brought down by the influents, which have, therefore, to be deposited in warpings before the waters are allowed to enter the canal. From Valiano, up to the point of division with the waters which enter the Tiber, the regulation of the lands is nearly the same, but the full effect that may be expected has not yet been produced." In 1838 Count Fossombroni was succeeded in the works of the Val di Chiana by the engineer Alessandro Mannetti, who, impressed with the length of time that would be required to complete the drainage of the valley by warping alone, proposed a mixed system, under which the advantages already gained from warping should be combined with the gradual lowering of Chiusa dei Monaci, thus obtaining a sufficient fall to enable the northern portion of the canal Maestro to flow as a river, and carry with it, by means of connecting canals, all the turbid waters from both sides of the valley. The Mannetti project, with some subsequent modifications by the Commendatore Carlo Possenti, C.E., has since formed the basis of the works carried out in the valley.

The new system was commenced in 1840 by the partial lowering of the Chiusa dei Monaci. The general works were carried on with excellent results during the period of the Grand Ducal Government, and for the first few years of the National Italian Government. By a law passed Nov. 20, 1859, and extended in 1865 (July 3) to the whole kingdom of Italy, regulating the public works of the State, the improvement works of the Val di Chiana were placed in the second category, under which their cost was to be borne half by the State, one-quarter by the provinces, and the remaining quarter by the landowners interested in their maintenance. This classification was unacceptable to the provinces and the other parties concerned, who were anxious that the works should be placed in the first category, or at the entire charge of the State, and a long administrative controversy ensued, which was only finally concluded in 1881, the Government maintaining the provisions of the law of 1865 against the pretensions of the interested parties as regards the ordinary works of maintenance, but granting, at the same time, a considerable sum towards the execution of the extraordinary works.

In the meantime, both the ordinary and extraordinary works under the Mannetti-Possenti system were carried on, though somewhat slowly, by the Government, which also had drawn up, at its own cost, the plans required to complete the definitive systematisation of the valley, the principal points of which are—1. Lowering the Chiusa dei Monaci a total of 5.25 metres, and enlarging the Canal Maestro of the Chiana as far as the Porto a Cesa, so as to enable it to receive the waters of the whole drainage basin and collect the drainage of the lower lands. The lowering of the sluice was completed on Jan. 1, 1883, and the waters of the Chiana now flow, without hindrance, as a river into the Arno. The other works are being actively carried on.—2. Connecting the torrents Foenna, Salarno, and Esse di Foiano, and discharging their waters into the main canal, with certain modifications, with regard to which a final decision has not been come to.—3. Connecting the various streams of the Agro Cortonese, at present retained in warpings, and carrying them into the main canal. Here, also, some modifications may occur later.—4. Connecting the various streams of the Agro Castiglione, likewise retained in warpings, and causing them, together with the streams of the Cortonese, to discharge their waters into the main canal.—5. Regulating the bed of the canal of Montecchio, reduced during the warpings, to a drainage canal for clear water.—6. Regulating the bed of the Chiana canal as a drainage canal for clear water until the warpings are completed.—7. Improvement of some other streams and construction of works of minor interest.

The actual superficial area in the Val di Chiana, improved and drained by warpings, is calculated at 7735-898 hectares. The extent of land still to be drained is 1087-201 hectares. This is exclusive of the territory freed from the influence of malaria, and consequently rendered permanently habitable. The value of the 10 large estates in the valley which, formerly belonging to the Order of St. Stephen, subsequently passed to the State, and were finally sold some years since to private owners, is calculated at 20,000,000 lire. The cost of reclaiming the valley was, up to the year 1845, entirely borne by the family of the Medici, after which date all the parties interested contributed to the maintenance of the works in proportion to population. I have no account of the expenditure incurred up to the year 1828, from which date, up to the year 1882, the total cost of the works amounted to, if it did not exceed, 5,700,000 lire.

By the law of July 23, 1881, the sum of 6,300,000 lire was inserted in the budget of the Ministry of Public Works for the works of the Val di Chiana. Of this amount 4,100,000 lire is at the total charge of the State, the balance of 2,200,000 lire being apportioned according to the provisions of the laws of March 20, 1865, and July 3, 1875. The average annual expenditure to serve as a basis for the repartition of the quotas is fixed at 92,445 lire 60 c., of which 90,000 lire were for works, and the balance for rents and the technical personnel. It is calculated that 10 years may elapse before the entire reclamation of the Val di Chiana is completed. The works, which depend directly from the Ministry of Public Works in Rome, with a central office placed at Arezzo, and conducted by the engineers of the Royal Corps of Civil Engineers, are under the direction of the Cavaliere S. Corradini. The resident engineer is Signor Marcucci. The above sketch-map of the province of Arezzo, and part of the provinces of Siena, Perugia, and Florence, represents a part of the Val di Chiana, showing the gradual alteration of the water-shed, between the 12th and 19th centuries.

**HOLLOWAY'S OINTMENT AND PILLS—RHEUMATISM AND NEURALGIA.**—Though the former disease remorselessly attacks persons of all ages, and the latter ruthlessly selects its victims from the weak and delicate, the persevering use of these remedies will infallibly cure both complaints. After the affected parts have been diligently fomented with hot brine, and the skin thoroughly dried, Holloway's ointment must be rubbed in firmly and evenly for a few minutes twice a day, and his pills taken according to the printed directions wrapped round each box of his medicine. Both ointment and pills are accompanied by instructions designed for the public at large, and no invalid, who attentively reads them, can now be at any loss how to doctor himself successfully.

## THE INFANCY OF RAILWAYS.

In connection with the early history of railways, the subjoined report of the late Robert Stephenson, reprinted in Messrs. De la Roche Brothers Anglo-Venezuelan Review for September, will be of general interest. They say, referring to the La Guayra and Caracas Railway:—"Sixty years ago, on July 23, 1824, a young engineer, 21 years of age, destined to become not only one of the first in his own country but one of the greatest engineers of the nineteenth century, arrived at La Guayra, at the invitation of Messrs. Herring, Graham, and Powles, English merchants, to make a survey for a road between that port and the City of Caracas. This was Mr. Robert Stephenson, who at his death in 1859 was deemed worthy of a resting place in Westminster Abbey among other celebrities of his country. Mr. Stephenson during two months carefully surveyed the ground between the two places above-mentioned, and presented to his employers the report which we have the pleasure of offering to the attention of our readers. This interesting document now emerges from its hiding place after a lapse of 60 years, and we think it will be read with the greatest interest. If the reader wishes to fully see the merit of this paper we would ask him to cast his mind back for a moment to the time when its author, undoubtedly guided by the inspiration of a true genius, wrote it and foresaw in his powerful brain the future of the railways of the world. It is one thing to talk of railways to-day and quite another thing to have thought about them 60 years ago, when only a short line had been essayed in England and a second line had been proposed to be constructed between La Guayra and Caracas, to be propelled of course by horses, as steam-power had not yet been successfully applied to locomotion.

After 60 years the scene has completely changed, and what Mr. Stephenson foresaw in 1824 has been realised in Venezuela in 1883. Nevertheless his surveys were not consulted in the construction of the existing railway between La Guayra and Caracas; and although the line is a very good one and the money invested in it is well placed it has many sharp curves and zigzags which it was found necessary to adopt in the construction of the line over the mountains, and on this account the trains can only consist of a limited number of cars, so as to allow the engine sufficient drawing power over so many small lines and zigzags, and consequently the working expenses are higher.

The figures presented in 1824 by Mr. Stephenson as representing the commercial intercourse between the two places have extraordinarily augmented. Instead of a tonnage of 5571 tons we have now 60,000 tons per year, and instead of paying \$17 per ton we pay at present \$7½. These two data make a full increase of 90,000% per annum, to which we join 16,000% for the transport of 50,000 passengers at \$2. Therefore, the total receipts of the La Guayra Railway will amount to 106,000% yearly, and deducting 50,000% for expenses the company will be capable of distributing 56,000% among its shareholders. The capital of the company is composed of 160,000% in debentures at 7 per cent., and 320,000% in fully paid-up shares. If we take from the proceeds 11,200% to pay the interest upon the debentures 44,800% will remain to pay a yearly dividend upon the shares—say, 14 per cent. per annum. We do not see the reason why these shares are quoted at a discount in London, as the enterprise is a very sound one, and progressing very favourably.

The returns during the four weeks, June 30 to July 23, have been as follows:—Passengers, 29,527-50 bolivares; parcels and luggage, 1830-32 bolivares; goods, 126,503-90 bolivares; storage, 36-90 bolivares; total, 157,893-62 bolivares, or 6315½ 18s., and the gross receipts from Jan. 1 to July 23 amount to 51,823%.

CARACAS, Sept. 12, 1824.

Messrs. HERRING, GRAHAM, and POWLES.

Gentlemen,—Conformably with my instructions, I have carefully examined the intervening country between the port of La Guayra and Caracas, and embraced every opportunity of ascertaining such data as might assist me in drawing a conclusive report respecting the feasibility of forming a road between the two places. I have now to lay before you the result of my enquiries and observations, and also the views I have taken of the capabilities of this country as far as regards the general introduction of roads. It is almost unnecessary in the present instance to enter into any detail of the incalculable advantages that may be expected to accrue to the country from such a mode of proceeding, for every one must be aware of them who has had an opportunity of discerning with what solicitude the more mature nations of the earth have applied themselves to the construction of carriage roads. In the old world there is scarcely to be found a single country in which the astonishing remnants of public labours of this species do not show with what activity the ancient Romans pursued this only path to opulence and greatness. They have been copied by later nations, and at the present day it is an unerring proof of the profits to be derived from inland communication that the prosperity of European kingdoms diminishes in the exact ratio with the scantiness of similar advantages.

As an enterprise of this nature in Colombia, the construction of a road between La Guayra and Caracas is much to be wished for. The former is the first, nay almost the only considerable seaport of Venezuela, and its vicinity to the metropolis must always point it out as the most eligible *entrepôt* of the whole of the northern provinces. By this measure the fertile plains of the interior which are now by the difficulties of communication rendered unable to compete with the more barren vicinity of the seacoasts will force their produce into the capital and port, and should we view the project in the light of an encouragement to emigration, what advantages may not be added from the stimulus to be given to agriculture. Seeing, therefore, that such vast increase of wealth will result from the introduction of good roads into this country, where the natural surface is so intersected in almost every direction with continuous chains of mountains of such a height as almost at present to form impenetrable barriers to communication between provinces whose intimate association with each other, both in a political and commercial point of view, appears to be the very life and prop of the constitution, it concerns the Government or those who may choose to speculate in the formation of roads to be careful in selecting such as are best calculated to give the utmost facility to intercourse of every description. In doing this it must be remembered that roads on the common construction would be extremely liable to be injured, and in many cases totally destroyed by the heavy falls of rain which, during a considerable portion of the year, descends with such violence as to deluge and sweep away, and not unfrequently to render the most perfect roads impassable. Occurrences of this kind might annually be expected which would make the disbursements on the roads amount to a very considerable sum, and I am satisfied would prove a serious obstacle where the undertaking was extensive, and required the outlay of a large capital, especially in the present restricted state of trade, and we have no reason to anticipate to what extent the trade might probably increase, though little doubt can be entertained but that it is slowly advancing.

But in enquiring into the nature of a scheme it is hardly fair to calculate on a future advance. It is after duly weighing these and many other casualties that would attend the construction and the carrying in effect of common roads in this country that I give you my opinion that it is not advisable in the present state of trade to expend large sums in undertakings of this nature, for I am convinced an adequate return could not be made. In consequence of such difficulties I now propose to you the expediency of introducing that kind of road known throughout England by the name of railroad, where its superior efficacy in every point of view is beginning to be duly appreciated, and I have no doubt will at a period, not far distant, supersede both inland navigation and the turnpike roads, now so general in every part of England.

Previous to my visit here, I listened attentively to the various objections that were urged as fatal to the application of railroads for public conveyance, such, for instance, as the great capital required for the formation; the power of monopoly that would thus be concentrated into the hands of a few individuals, who might at their pleasure levy such tolls as they thought fit, and thus enrich themselves at the public expense; the necessity of having the carriages of a peculiar construction and precisely similar. These and several of minor importance formed the chief of the objections against railroads, but, in my opinion, they serve, when, candidly considered, to

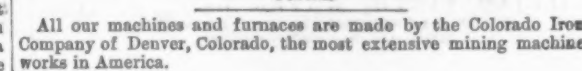


soon after this obstacle is surmounted the road enters the plain of Catia de la Mar, and from thence the country is pretty favourable the whole way to La Guayra. I would have made an accurate and minute survey and profile of the whole line, by which I could have estimated to a nicety the total cost of such an undertaking, but learning soon after my arrival at Caracas that several merchants with the intendant of the province had in contemplation to commence a road, and that they had employed men to clear away the wood to a sufficient breadth in order that they might ascertain the practicability, I consequently gave up the idea of going to the expense of clearing away the road in another direction which I had selected for my road, and of course I contented myself with the observations I was enabled to make by the means already open to me. I cannot form an accurate judgment of the sum that would have been required to make such an opening in the wood, but I should think not less than \$400 or \$500. The probability is that it would have exceeded this. This, therefore, will be a satisfactory reason for my not proceeding

Now by direct proportion and the equilibrium of bodies on inclined planes, we find that on an ascent of this rate, the weight of 145 lbs. (which we agree to be one horse power) will equalise 6992 lbs. on the plane, which differs but little from the performance of a horse by the other mode of calculation, and this difference is not more than what we may conceive sufficient to impel and put the required momentum into the burthen. We shall, therefore, consider 6000 lbs., which is a fair medium between the result of the modes of calculation, as the

Calculations.—571 tons annually to be raised, or 27 tons each mule per day. But when the new road is finished the mules will be enabled to pass six times back and forward per week, instead of at present four times. The daily weight to be raised will, therefore, be diminished in the ratio of 4 to 6, which gives the weight 18 tons, or more accurately 40,000 lbs.—R. S.

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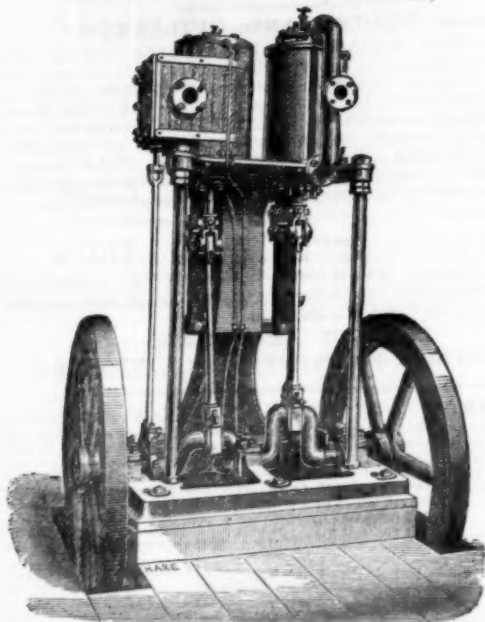
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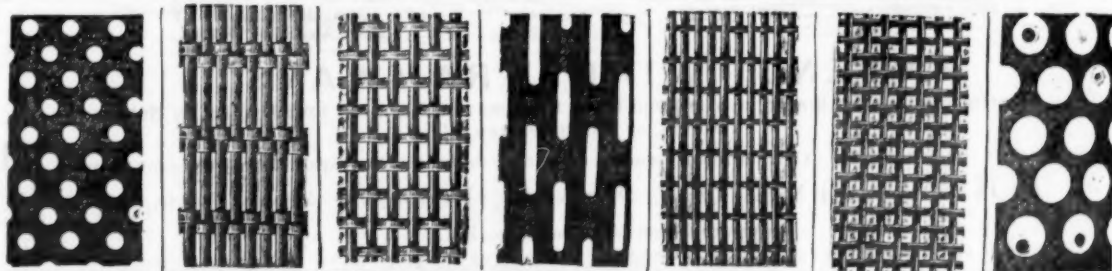
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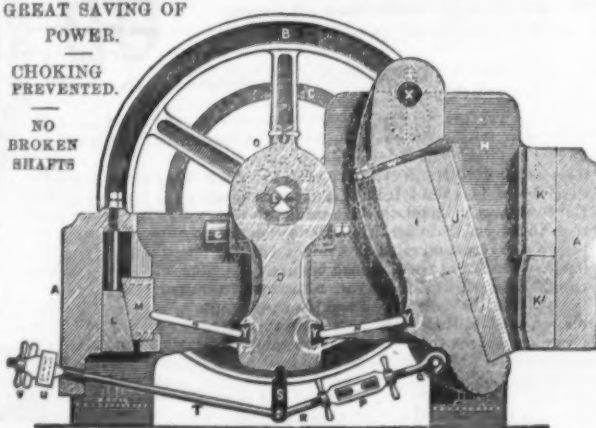
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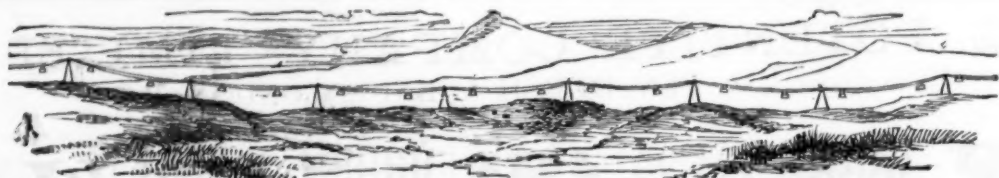
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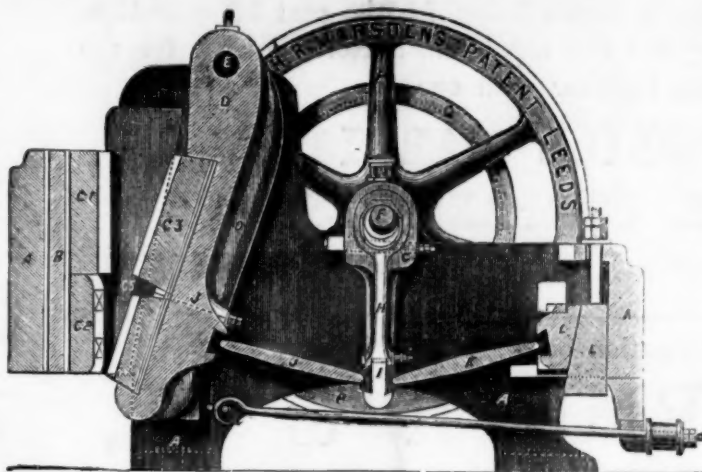
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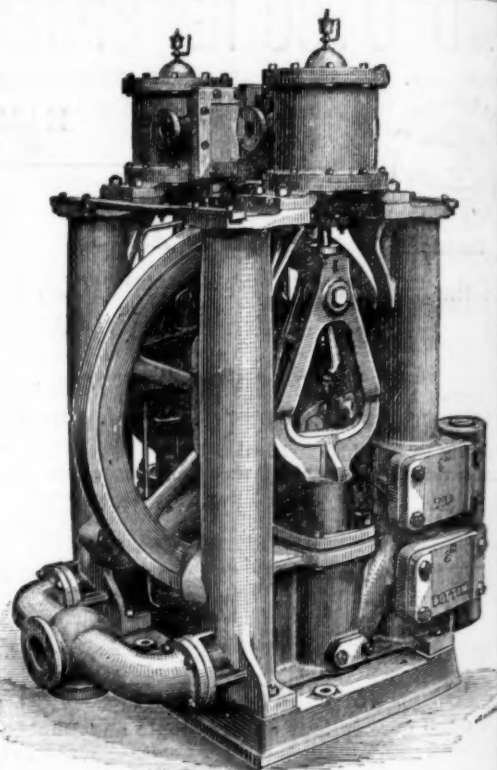
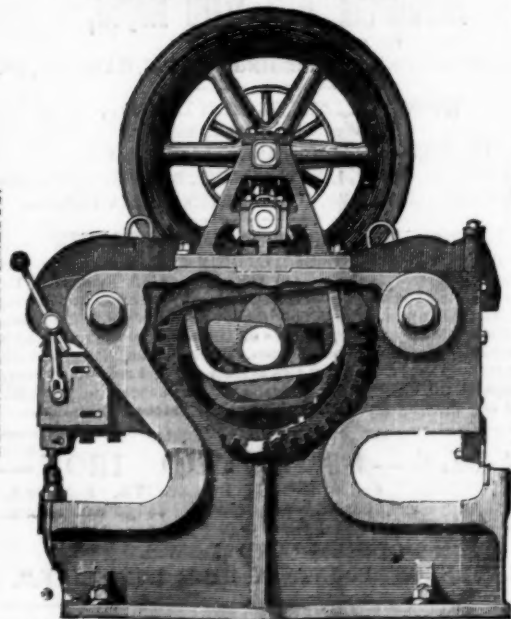
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